

TC-156

443

E Model
AEP Model



LL/STEREO CASSETTE-CORDER

SPECIFICATIONS

Power Requirements:	110V, 127, 220 and 240V, AC 50/60Hz (AEP) 100 ~ 110V, 115 ~ 127V, 200 ~ 220V and 230 ~ 250V, AC 50/60Hz (E) DC 6V	Outputs:	Two LINE INPUTs Impedance: 560 kΩ Maximum sensitivity: -22 dB (60 mV) REC/PB connector Input impedance: 2 kΩ
Power Consumption:	AC 8.5 W (E) AC 12W (AEP)	MONITOR output	Two LINE OUTPUTs Impedance: 10 kΩ or more Output level: 0 dB (0.775 V) with 100 kΩ load
Track System:	Four-track stereo/LL	PHONES jack	Accepts an 8 ohms earphone Output level: 0 dB (0.775 V) with 10 kΩ load
Tape Speed:	4.8 cm/s (1 7/8 ips)	REC/PB connector	Impedance: 8 Ω Output level: -30 dB (25 mV)
Frequency Response:	40 ~ 10,000 Hz (at normal tape) 40 ~ 13,000 Hz (at chromium dioxide tape)	Battery Life:	Output impedance: 8 kΩ Load impedance: 50 kΩ
Signal-to-Noise Ratio:	47 dB	Speaker:	Long-life dry cell Approximately 7.5 hours of continuous recording by using built-in microphone
Wow and Flutter:	0.22% (RMS) weighted.	Rechargeable battery	Rechargeable battery Approximately 6.5 hours of continuous recording by using built-in microphone (charging time: approximately 24 hours)
Overall Distortion:	2.5%:	Semiconductors:	10 cm (4") dynamic speaker Voice coil impedance: 8 Ω
Erase Ratio:	60 dB	Dimensions:	1 FET, 26 transistors and 9 diodes
Cross Talk:	55 dB (between tracks) 26 dB (between channels)	Weight:	322(w) x 80(d) x 238(h) mm 12 11/16(w) x 3 3/16(d) x 9 3/8 (h) inches
Power Output:	1.5W maximum	Weight:	3.8 kg, 8 lb 7 oz (with battery)
Record Bias Frequency:	Approx. 85 kHz		
Erase Head:	EF152-3602 (540 Ω/80 kHz)		
Record/playback Head:	PP128-3602 (750Ω/1 kHz)		
Motor:	D-009F (servo controlled)		
Built-in Microphone:	C-1002A (electret condenser)		
Automatic Shut-off Mechanism:	Tape tension detection system (operates in playback and record modes only)		
Inputs:	Two MIC inputs Impedance: Low impedance Maximum sensitivity: -72 dB (0.2 mV)		

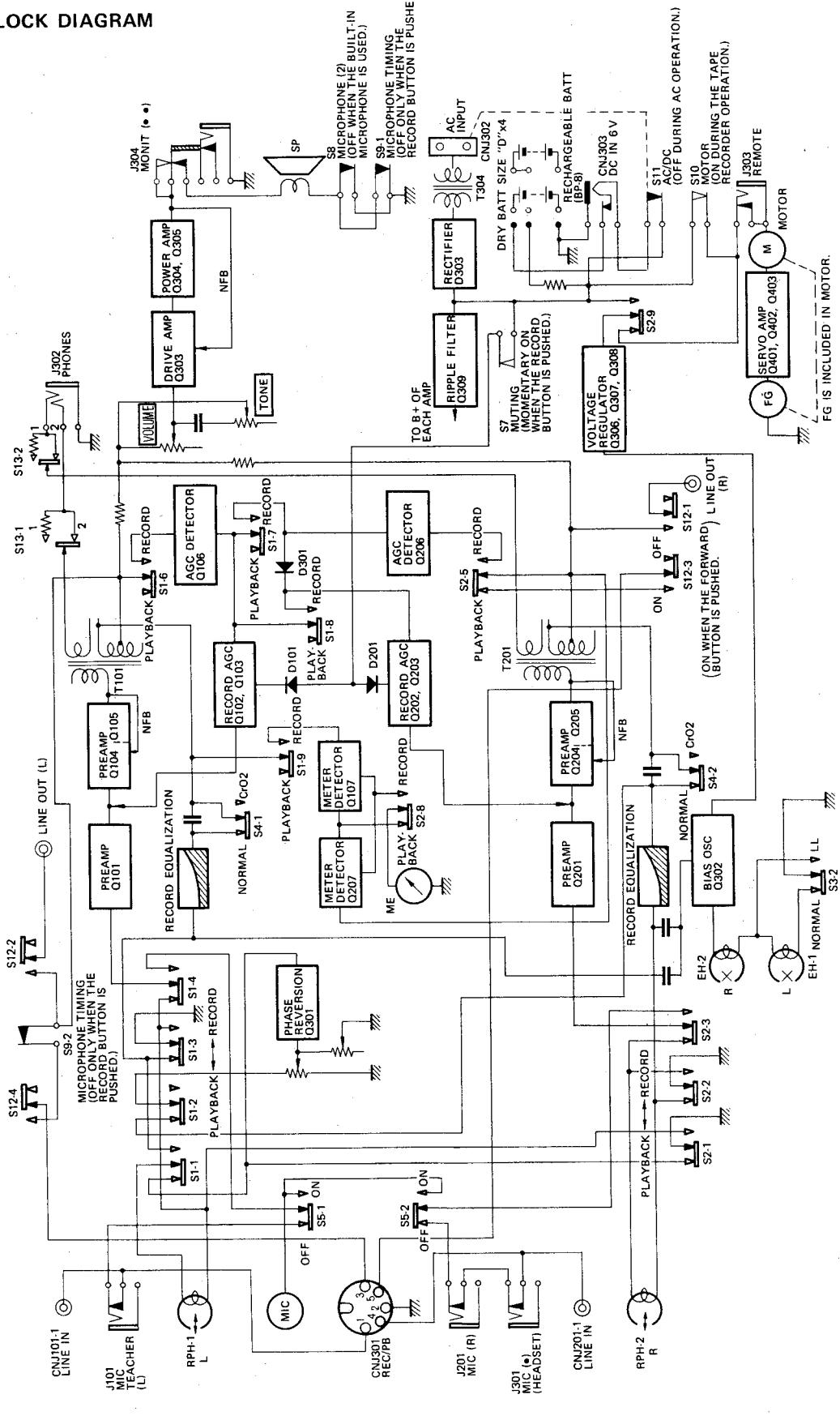
SONY
SERVICE MANUAL

443

SECTION 1

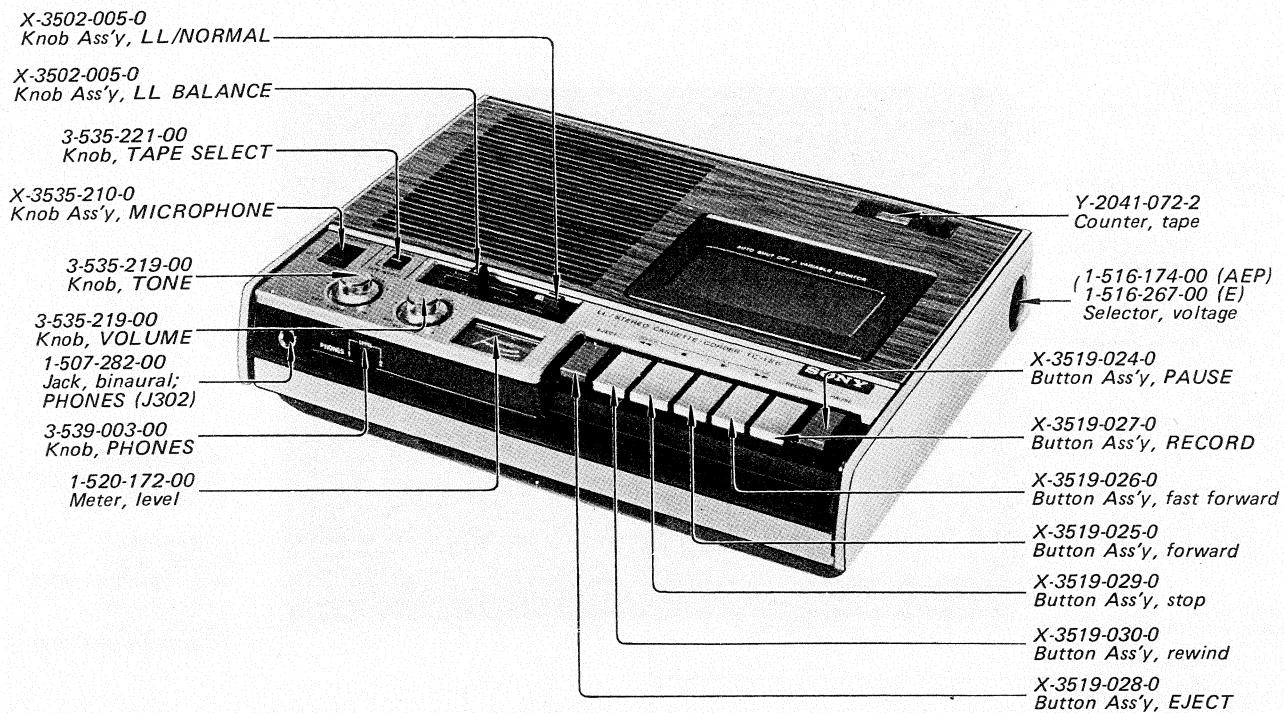
OUTLINE

1-1. BLOCK DIAGRAM

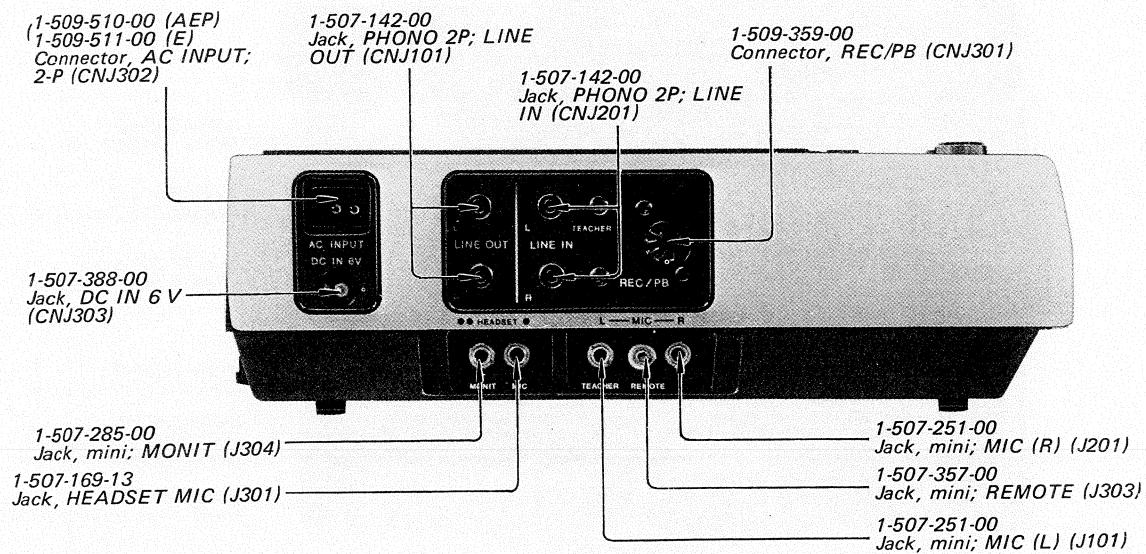


1-2. EXTERNAL VIEWS

(1)

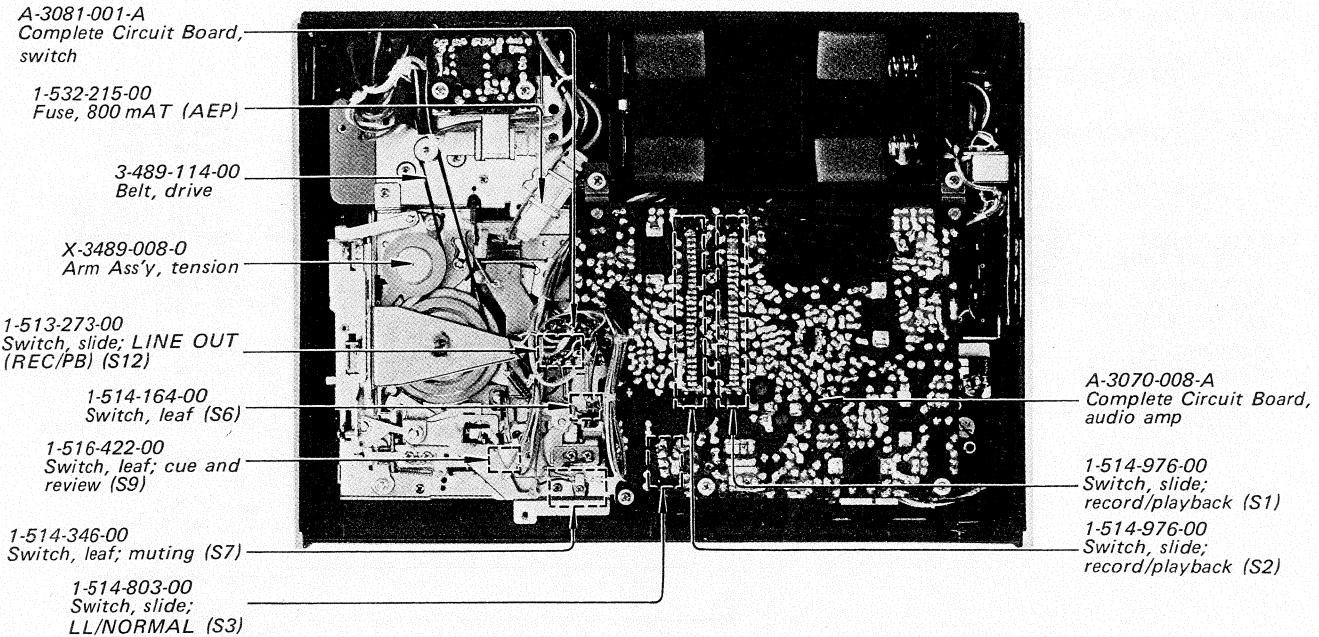


(2)

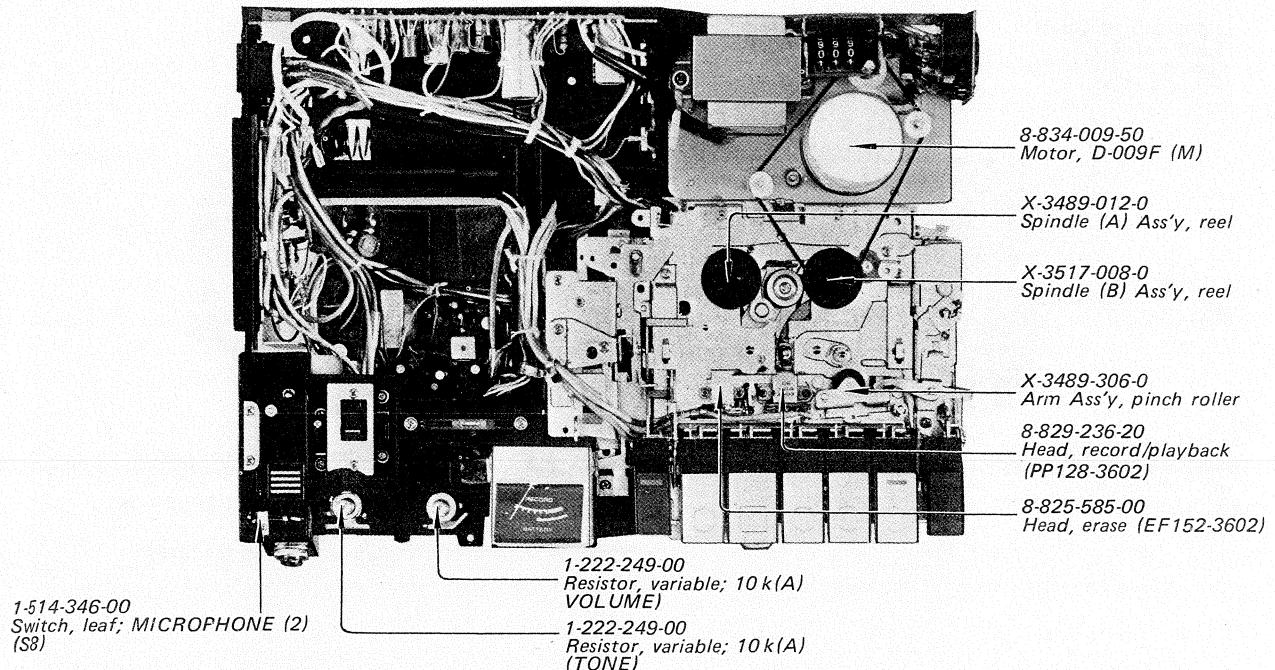


1-3. INTERNAL VIEWS

(1)



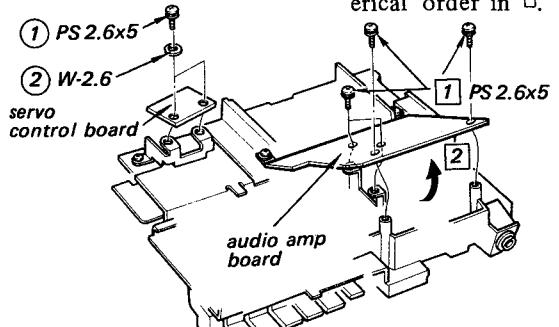
(2)



Complete Circuit Board Removal

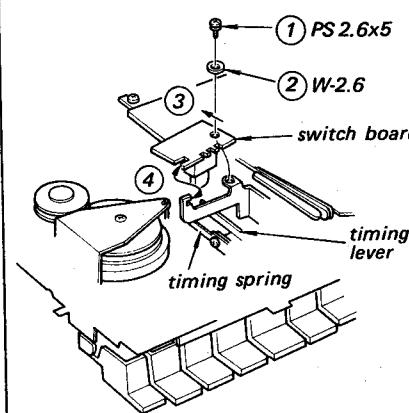
Servo control circuit board . . . Remove it by following in the num-

Audio amp circuit board Remove it by following in the numerical order in \bigcirc .
numerical order in \square .



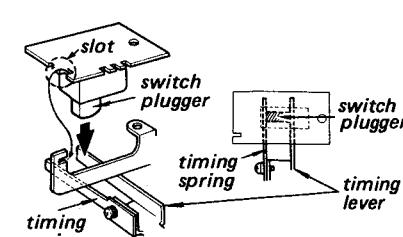
Switch Board Removal

Remove the switch board according to circled numbers.



Switch Board Installation

1. Insert the switch plugger between timing lever and timing spring as shown.
2. Attach the switch board as shown.



MEMO

Take-up Reel Spindle, Supply Reel Spindle, Motor and Idler Ass'y Removal

- Motor Remove it in the numerical order in \circ .

Supply

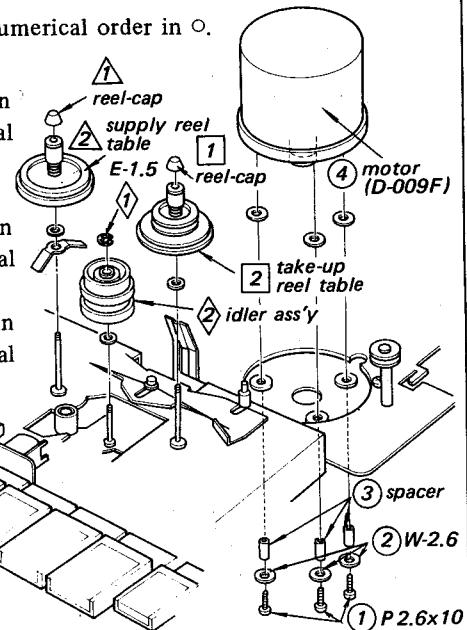
reel spindle . . . Remove it in the numerical order in Δ .

Take-up
reel spindle . . . Remove it in
the numerical

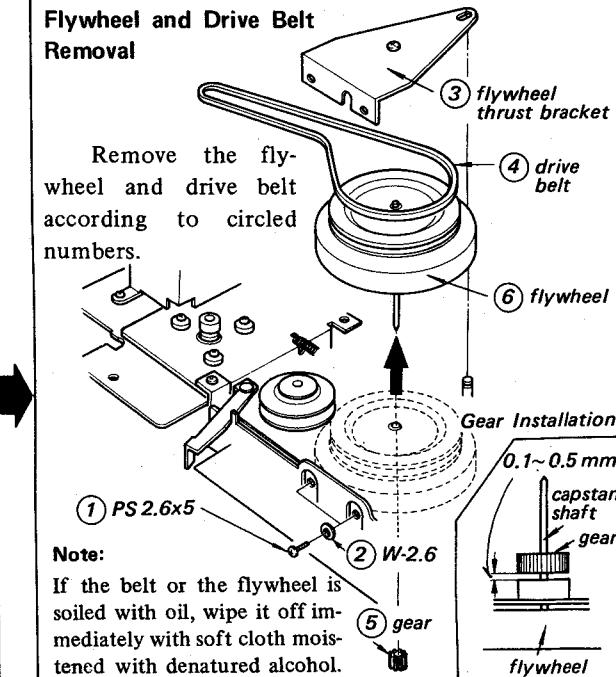
Idler Ass'y Remove it in
order in \square .
the numerical
order in \diamond .

Note:

- 1) After completing the motor replacement, perform motor speed adjustment.
- 2) Remove the lock paint of motor pulley set-screw by using soldering iron, when removing motor pulley.



Flywheel and Drive Belt Removal

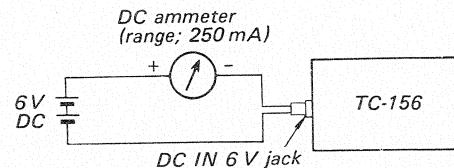


SECTION 3 MECHANICAL ADJUSTMENTS

FLYWHEEL THRUST PLAY ADJUSTMENT

— Playback Mode —

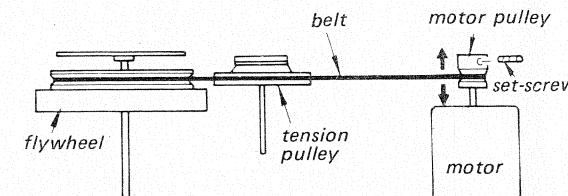
1. Loosen the thrust screw for sufficient flywheel play.
2. Tighten the screw until current suddenly increases, then loosen the screw 90 degrees.
3. Apply locking compound to the screw.



MOTOR PULLEY HEIGHT ADJUSTMENT

— Stop Mode —

Loosen the set-screw, and adjust the height of motor pulley so that belt is straight.

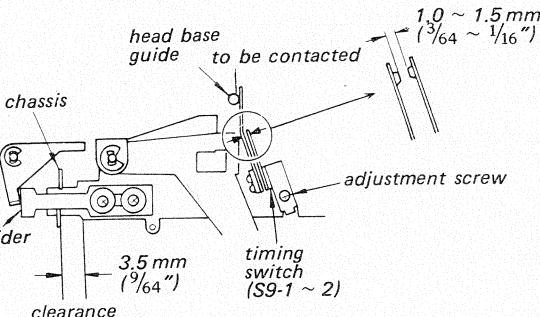


TIMING SWITCH POSITION ADJUSTMENT

— Stop Mode —

When slowly depressing the record button for the specified clearance, adjust the position of timing switch to have the specified contact separation.

Note: After completing the adjustment, apply locking compound to adjustment screw.



MUTING SWITCH POSITION ADJUSTMENT

— Stop Mode —

1. Push the adjustment plate to the full in the direction shown by the arrow **A**, and tighten it with adjustment screws **①**.
2. Loosen the adjustment screws **②**, and adjust the position of cam for the specified clearance.
3. Loosen the adjustment screw **③**, and adjust the position of leaf switch (S7) while pushing the slider in the direction shown by the arrow **B** so that muting lever pushes the leaf switch to have the specified contact separation.

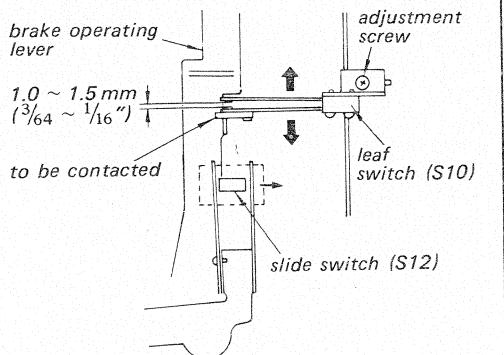
Note: After completing the adjustment, apply locking compound to adjustment screws **①**, **②**, and **③**.

POWER SWITCH POSITION ADJUSTMENT

— Stop Mode —

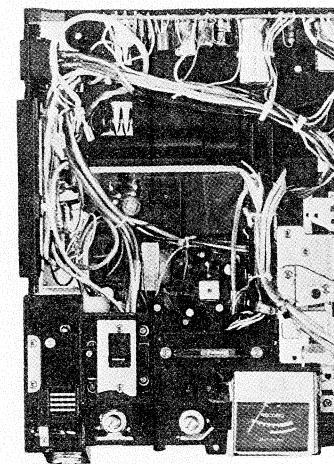
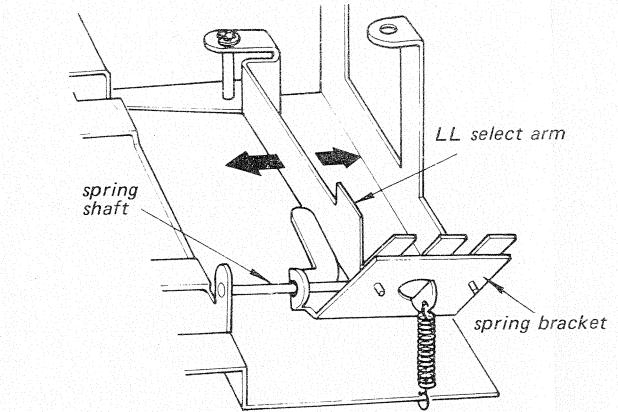
1. Loosen the adjustment screw, and adjust the position of leaf switch (S10) to have the specified contact separation.
2. When slowly depressing the forward button, check to see that the slide switch (S12) is switched over after leaf switch has been closed.

Note: After completing the adjustment, apply locking compound to adjustment screw.



LL SELECT ARM ADJUSTMENT

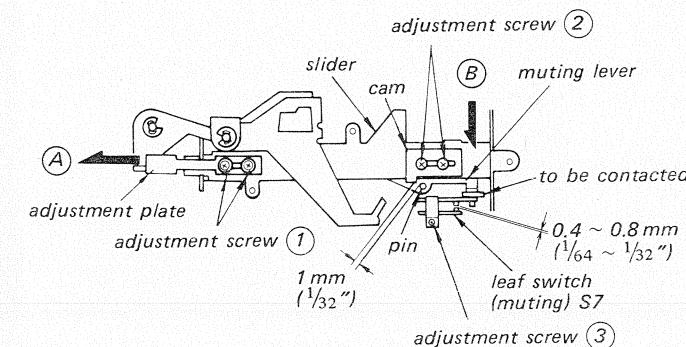
1. Switch the LL select lever to LL and NORMAL.
2. Adjust by bending the LL select arm so that the shaft-lengthwise play of the spring bracket is the same in LL mode and in NORMAL mode.



PINCH ROLLER PRESSURE MEASUREMENT

— Playback Mode —

1. Check to see that capstan is parallel to pinch roller.
2. Push pinch roller away from the capstan using tension gauge, as shown by the arrow **A**. Allow pinch roller to return slowly. The pressure (tension) should be measured at the point where the pinch roller just contacts the capstan. If necessary, adjust pinch roller pressure by bending spring.

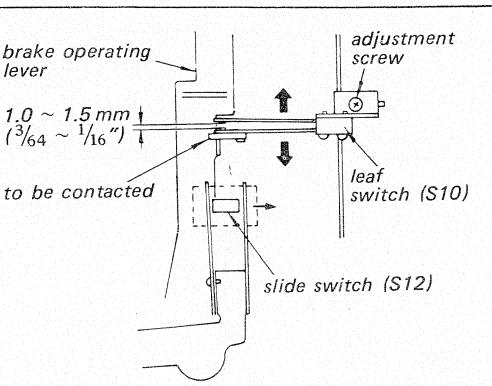


POWER SWITCH POSITION ADJUSTMENT

- Stop Mode -

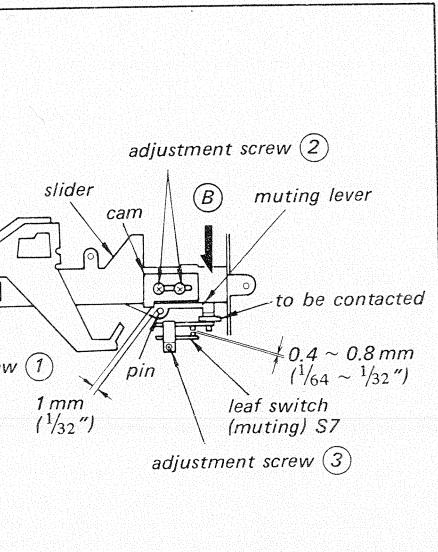
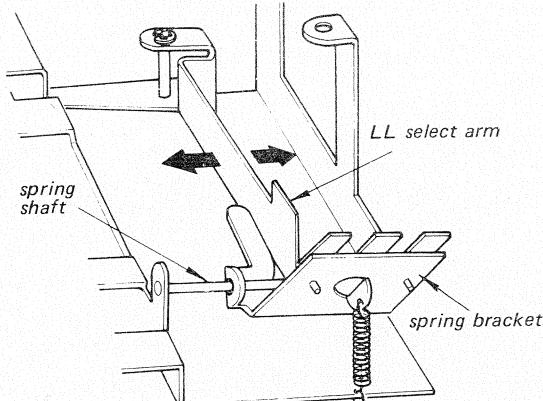
1. Loosen the adjustment screw, and adjust the position of leaf switch (S10) to have the specified contact separation.
2. When slowly depressing the forward button, check to see that the slide switch (S12) is switched over after leaf switch has been closed.

Note: After completing the adjustment, apply locking compound to adjustment screw.



LL SELECT ARM ADJUSTMENT

1. Switch the LL select lever to LL and NORMAL.
2. Adjust by bending the LL select arm so that the shaft-lengthwise play of the spring bracket is the same in LL mode and in NORMAL mode.



Fast Forward, Forward and Rewind Torque

Mode	Torque meter	Meter reading
Forward	* CQ101	30 ~ 50 g·cm
Fast Forward Rewind	* CQ201	60 ~ 140 g·cm

* SONY cassette type torque meter

Model Part No.

CQ101 Y-20926-01-1
CQ201 Y-20926-11-1

PAUSE TIMING CHECK

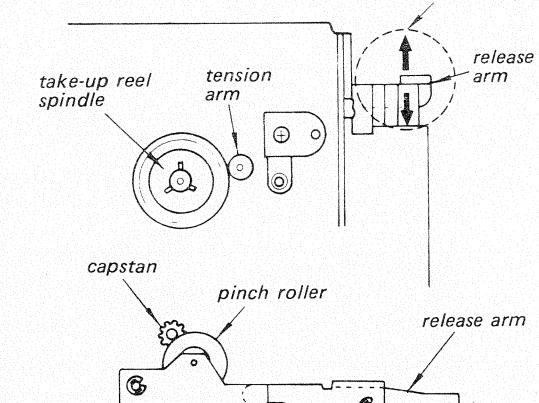
- Playback Mode -

1. When depressing the PAUSE button, check to see that
 - a) pinch roller releases from capstan.
 - b) tension arm releases from take-up reel spindle.
2. When releasing the PAUSE button, check to see that
 - a) tension arm contacts take-up reel spindle.
 - b) pinch roller contacts capstan.

Note: Above functions a) and b) may be found in the same time.

If necessary, bend the release arm in the direction shown by the arrow.

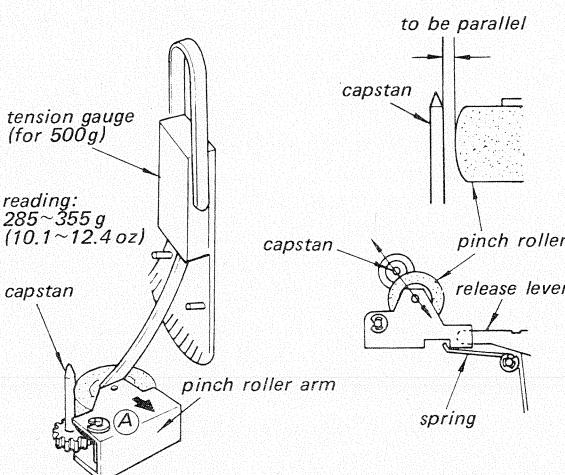
Bend this point.



PINCH ROLLER PRESSURE MEASUREMENT

- Playback Mode -

1. Check to see that capstan is parallel to pinch roller.
2. Push pinch roller away from the capstan using tension gauge, as shown by the arrow A. Allow pinch roller to return slowly. The pressure (tension) should be measured at the point where the pinch roller just contacts the capstan. If necessary, adjust pinch roller pressure by bending spring.



SECTION 4

ELECTRICAL ADJUSTMENTS AND MEASUREMENTS

PRECAUTION

1. Clean the following parts with alcohol moistened swab:
 - Record/playback head
 - Erase head
 - Capstan
 - Pinch roller
 - Rubber belts
 - Idlers
2. Demagnetize record/playback head with a head demagnetizer.
(Do not use magnetized screwdriver for adjustments).
3. After completing the adjustments, apply locking compound to adjustment parts.
4. Adjustments should be performed in the order listed in this service manual.
5. Adjustments and measurements should be performed with rated power supply voltage unless otherwise specified.

Test Equipment/Tools Required

audio oscillator (af osc)
 VTVM
 DC ammeter
 DC voltmeter
 monaural cassette-corder for chromium dioxide tape
 digital frequency counter
 or speed checker (SONY LFM-30)
 400 Hz bandpass filter
 resistors 300 Ω , 600 Ω , 100 k Ω , 8 Ω (4 W)
 attenuator
 wow meter
 distortion meter
 SONY test tapes
 P-4-A81 (6.3 kHz, -10 dB)
 P-4-L81 (333 Hz, 0 dB)
 SPC-4 (1 kHz, 0 dB)
 WS-48 (3 kHz, 0 dB)
 blank tape cassette (completely erased)
 normal
 chromium dioxide

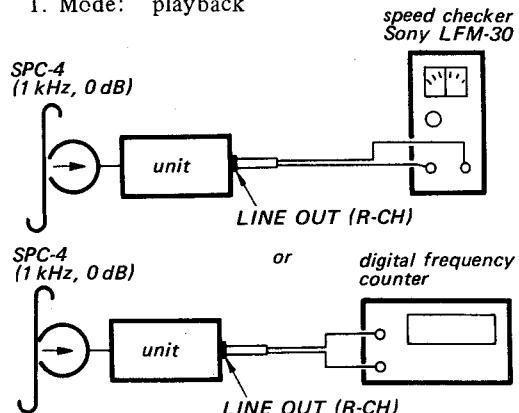
1. Tape Speed Adjustment

Settings:

LL/NORMAL switchNORMAL
 TAPE SELECT switchNORMAL
 Power source6 V DC

Procedure:

1. Mode: playback



Adjust R402 for 1000 Hz reading on the frequency counter or for 0 % on the speed checker.

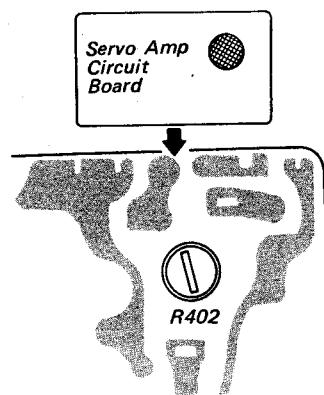
Specifications:

- 1.

Speed checker	Digital frequency counter
-2.5 ~ +3 %	975 ~ 1030 Hz

2. Frequency difference between beginning and end of tape should be within 1% (10 Hz).

Adjustment Location:



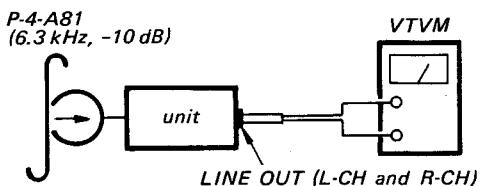
2. Record/Playback Head Azimuth Adjustment

Settings:

LL/NORMAL switch NORMAL
 TAPE SELECT switch NORMAL

Procedure:

1. Mode: playback



Adjust the adjusting screw (Fig. B) to obtain maximum reading on the VTVM.

Notes:

a) A few peaks may appear as illustrated in Fig. A, take the biggest peak.
 b) If the peak values for L-CH and R-CH are not obtained in the same azimuth angle, take the mid angle between them and the deviation should be within 1 dB.

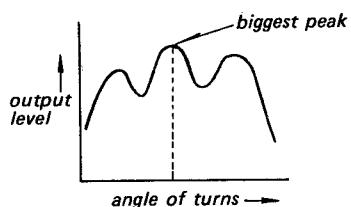


Fig. A

Adjustment Location:



Fig. B

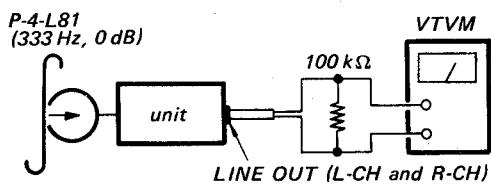
3. Playback Level Adjustment

Settings:

LL/NORMAL switch NORMAL
 TAPE SELECT switch NORMAL

Procedure:

1. Mode: playback



Select the resistor R113, R213 and R114, R214 for 2 dB (0.95 V) reading on the VTVM.

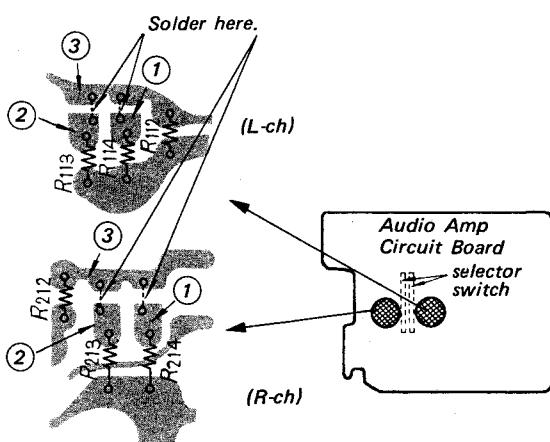
Note: In case the LINE OUTput level is higher than the specified value, solder the point ② and ③.

In case the LINE OUTput level is lower than the specified value, solder the point ① and ③.

Specifications:

(1) 2 dB \pm 2 dB (0.775 ~ 1.2 V)
 (2) Level difference between L-CH and R-CH should be within 3 dB.

Adjustment Location:



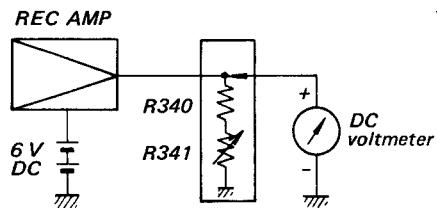
4. B+ Voltage Adjustment for Record Bias Oscillator

Settings:

LL/NORMAL switch NORMAL
TAPE SELECT switch NORMAL

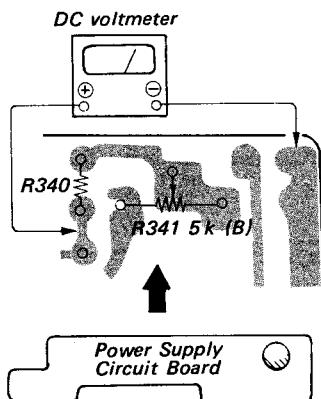
Procedure:

1. Mode: record



Adjust R341 for $4.5V \pm 0.1V$ reading on the voltmeter.

Adjustment Location:



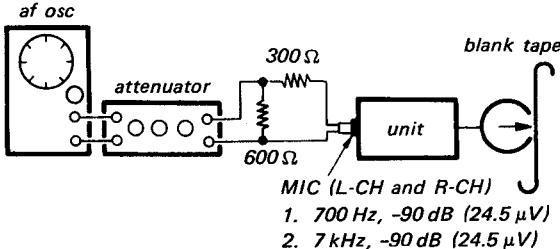
5. Record Bias Adjustment

Settings:

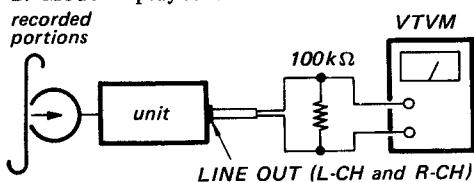
LL/NORMAL switch NORMAL
TAPE SELECT switch NORMAL

Procedure:

1. Mode: record



2. Mode: playback



Be sure that the level difference between 7 kHz signal and 700 Hz signal is within the specified value.

Specifications:

(1)	Frequency	Level Difference
	700Hz 7 kHz	0 dB $\pm \frac{2}{4}$ dB

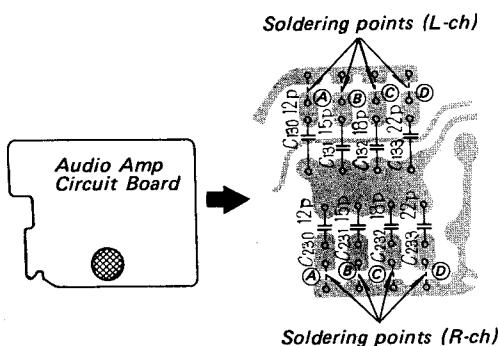
2. Level difference between the L-CH and R-CH should be within 3 dB.

Note: If necessary, adjust by soldering points (A), (B), (C) or (D).

In case the output level at 7 kHz is higher than at 700 Hz, increase capacitance value.

In case the output level at 7 kHz is lower than at 700 Hz, decrease capacitor capacitance value.

Adjustment Location:



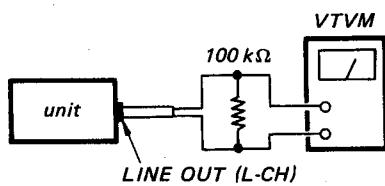
6. Trap Coil Adjustment

Settings:

LL/NORMAL switch LL
TAPE SELECT switch NORMAL

Procedure:

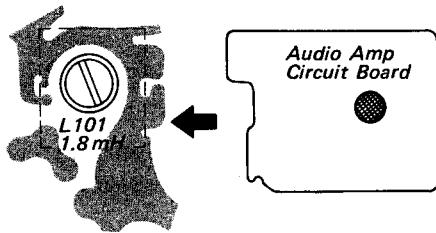
1. Mode: record



Adjust the coil L101 for minimum reading on the VTVM.

Specification: less than -20 dB (77 mV)

Adjustment Location:



7. Battery Indicator Calibration

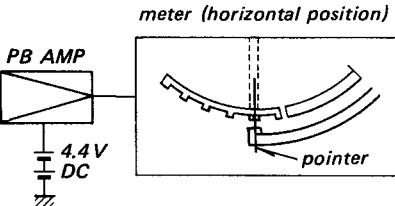
Settings:

TONE control HIGH max
VOLUME control MIN
Power source 4.4 V DC

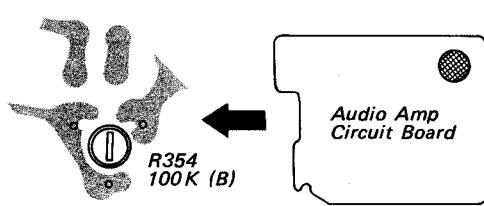
Procedure:

1. Mode: playback

Adjust R354 so that pointer indicates as shown.

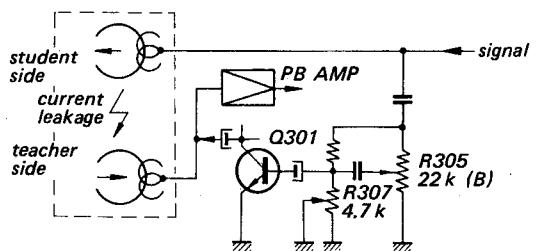


Adjustment Location:



8. Cross Talk Canceling Adjustment

Note: The purpose of this adjustment is to cancel current leakage from student side (record) to teacher side (playback).

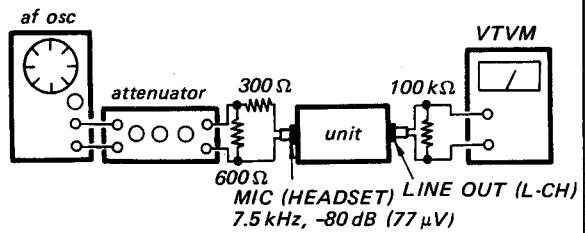


Settings:

LL/NORMAL switch LL
TAPE SELECT switch NORMAL

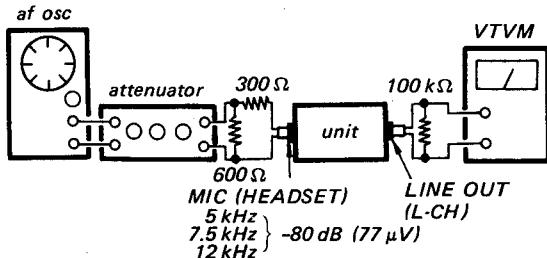
Procedure:

1. Mode: record



Adjust R305 and R307 for minimum reading on the VTVM.

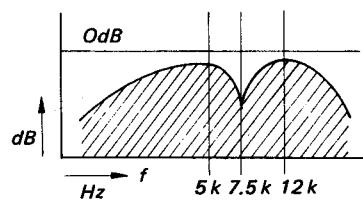
2. Mode: record



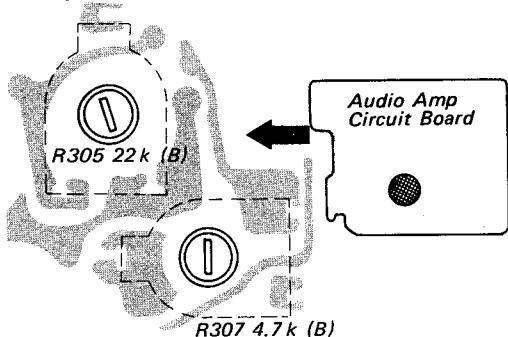
Be sure that the LINE OUTput level is within the specified value.

Specifications:

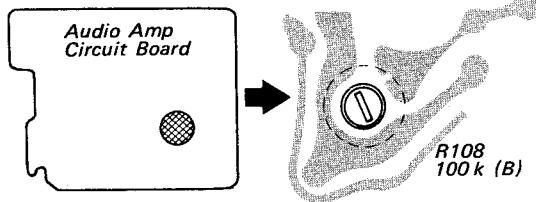
- less than 0 dB (0.775 V) at 5 kHz and 12 kHz signals
- less than -5 dB (0.44 V) at 7.5 kHz signal.



Adjustment Location:



Adjustment Location:



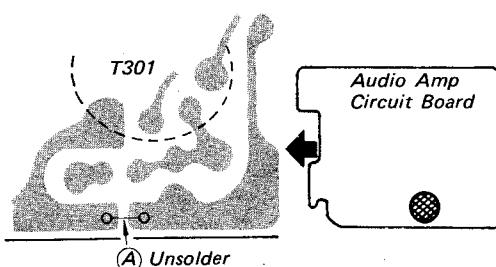
9. AGC Stereo Balance Adjustment

Settings:

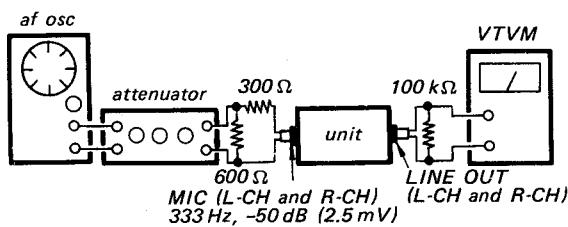
LL/NORMAL switch NORMAL

Procedure:

1. Unsolder the point **A**.



2. Mode: record



Adjust R108 to obtain the same output level for both L-CH and R-CH.

Specifications:

- 2.5 dB \pm 2 dB (0.82 ~ 1.3 V)
- level difference between the L-CH and R-CH should be within 0.5 dB.

3. After completing the adjustment, solder the point **A**.

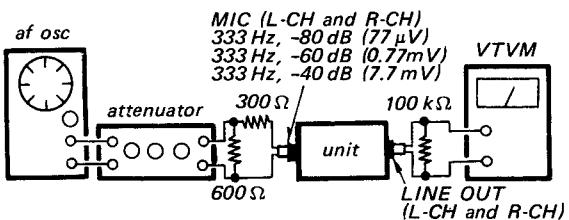
10. AGC Level Measurement

Settings:

LL/NORMAL switch NORMAL

Procedure:

1. Mode: record



Be sure that LINE OUTput level is as specified.

Specifications:

MIC input level	LINE OUTput level
-80 dB (77 μ V)	-8 dB \pm 2 dB (0.25 ~ 0.39 V)
-60 dB (0.77 mV)	1 dB \pm 2 dB (0.69 ~ 1.1 V)
-40 dB (7.7 mV)	4 dB \pm 3 dB (0.95 ~ 1.7 V)

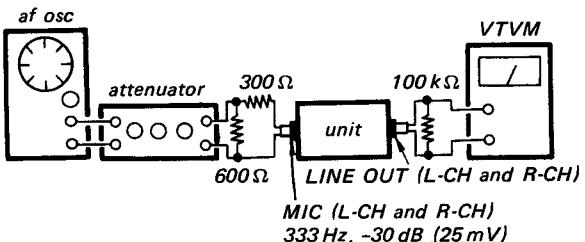
11. AGC Recovery Time Measurement

Settings:

LL/NORMAL switch NORMAL

Procedure:

1. Mode: record



2. Suddenly decrease the input signal to -60 dB (0.77 mV).
3. Measure the recovery time while the output level increases 10 dB from -30 dB (25 mV) to -20 dB (77 mV).

Specification: 20 to 120 seconds

12. Playback Signal-to-Noise Ratio Measurement

Settings:

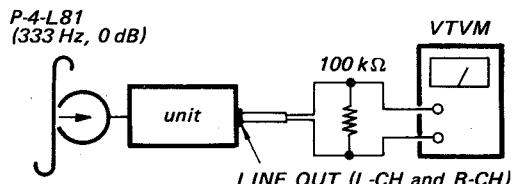
LL/NORMAL switch NORMAL

TAPE SELECT switch NORMAL

Power source 6 V DC and rated AC voltage

Procedure:

1. Mode: playback



2. Read the L-CH and R-CH LINE OUTput levels on the VTVM.
3. When depress the PAUSE button, read the noise level on the VTVM, and make sure that difference between the noise level and the level at step 2.

Specifications:

- (1) greater than 46 dB with battery.
- (2) greater than 42 dB with household current.

13. Overall Signal-to-Noise Ratio Measurement

Settings:

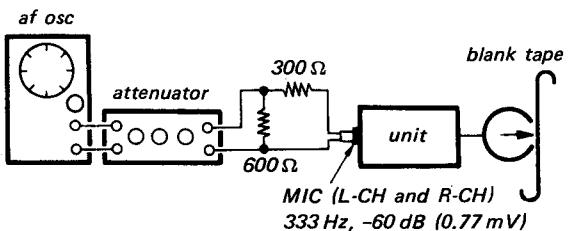
LL/NORMAL switch NORMAL

TAPE SELECT switch NORMAL

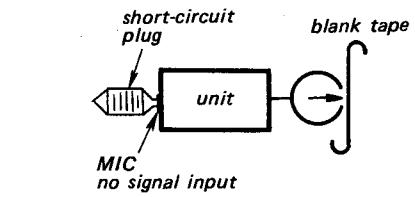
Power source 6 V DC and rated AC voltage

Procedure:

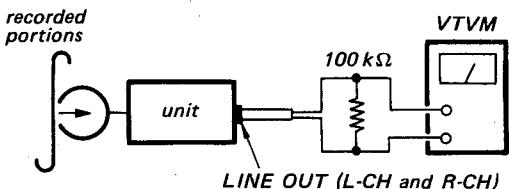
1. Mode: record



2. Mode: record



3. Mode: playback



Make sure that the level difference between the 333 Hz and no signal portions are as specified.

Specifications:

- (1) greater than 45 dB with battery
- (2) greater than 40 dB with household current.

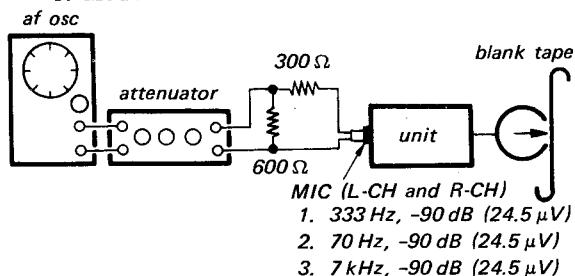
14. Overall Frequency Response Measurement

Settings:

LL/NORMAL switch NORMAL
TAPE SELECT switch NORMAL
or CrO₂

Procedure:

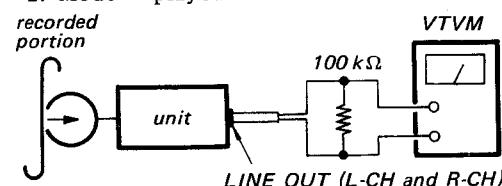
1. Mode: record



Note: Use blank tape as follows;

TAPE SELECT switch	Using cassette tape
NORMAL	normal
CrO ₂	chromium dioxide

2. Mode: playback



Be sure that the level deviation of each frequency relative to 333 Hz signal is as specified.

Specifications:

Mode	TAPE SELECT switch mode	Record signal	Playback LINE OUT signal
NORMAL record	NORMAL	70 Hz	0 dB ± $\frac{1}{2}$ dB (0.19~0.775 V)
		7 kHz	0 dB ± $\frac{2}{3}$ dB (0.49~0.95 V)
NORMAL playback	CrO ₂	7 kHz	0 dB ± $\frac{4}{3}$ dB (0.55~1.1 V)
		70 Hz	0 dB ± $\frac{9}{16}$ dB (0.14~0.775 V)
LL record	NORMAL	7 kHz	0 dB ± $\frac{2}{3}$ dB (0.39~0.95 V)
		70 Hz	0 dB ± $\frac{9}{16}$ dB (0.14~0.775 V)

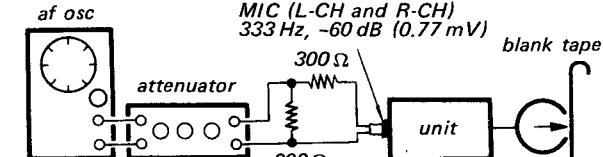
15. Overall Distortion Measurement

Settings:

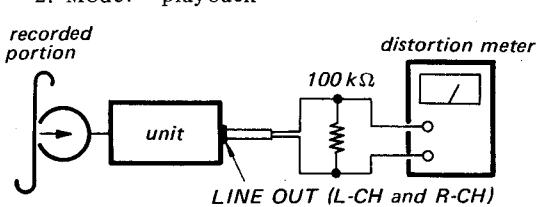
LL/NORMAL switch NORMAL
TAPE SELECT switch NORMAL

Procedure:

1. Mode: record



2. Mode: playback



Measure the distortion.

Specification: less than 4%

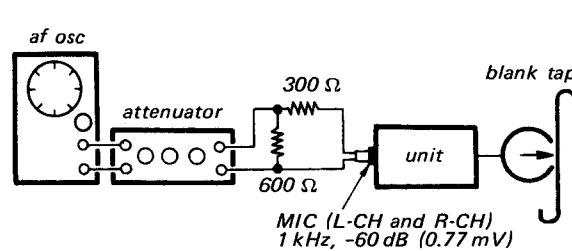
16. Overall Maximum Output Measurement

Settings:

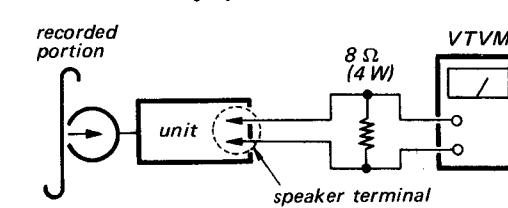
LL/NORMAL switch NORMAL
TAPE SELECT switch NORMAL
TONE control HIGH max
VOLUME control MAX
Power supply 6 V DC and rated AC power voltage

Procedure:

1. Mode: record



2. Mode: playback



Measure the output level.

Specification:

Power Supply	Output Level
DC	more than 11 dB (2.8 V)
AC	more than 10 dB (2.5 V)

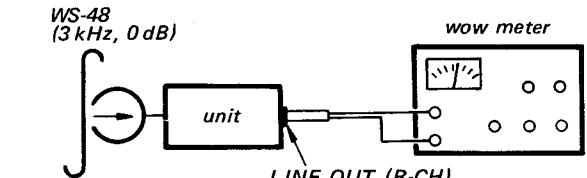
17. Wow and Flutter Measurement

Settings:

LL/NORMAL switch NORMAL
TAPE SELECT switch NORMAL

Procedure:

1. Mode: playback



Measure wow and flutter for beginning and end portions of tape (WS-48).

Specification: less than 0.34% (RMS)

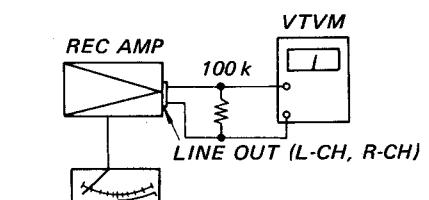
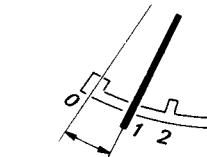
18. Bias Current Leakage Measurement

Settings:

MICROPHONE switch OFF

Procedure:

1. Mode: record (No signal)



Be sure that the L-CH and R-CH LINE OUTput levels are as specified.

Specifications:

- less than -12 dB (0.19 V)
- The level meter indication should be within "1" on the scale.

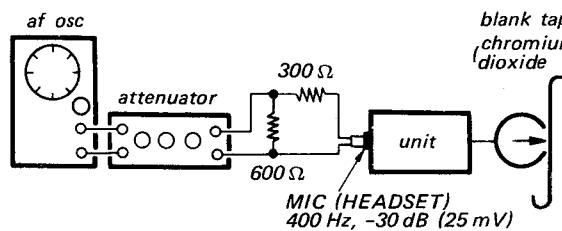
19. Erase Ratio Measurement (1)

Settings:

LL/NORMAL switch LL
 TAPE SELECT switch CrO₂
 LL BALANCE control STUDENT
 max

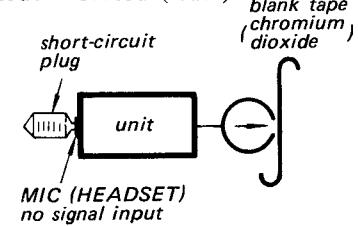
Procedure:

1. Mode: record

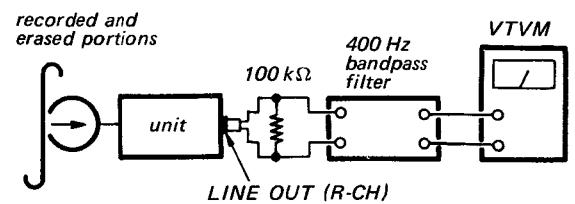


2. Rewind a half of the signal recorded portion of the tape cassette.

3. Mode: record (erase)



4. Mode: playback



Make sure that the level difference between two portions is as specified.

Specification: 60 dB or more

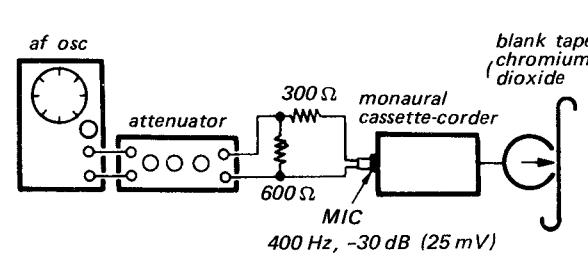
20. Erase Ratio Measurement (2)

Settings:

LL/NORMAL switch NORMAL
 TAPE SELECT switch CrO₂
 Prepare a monaural cassette-corder using chromium dioxide tape.

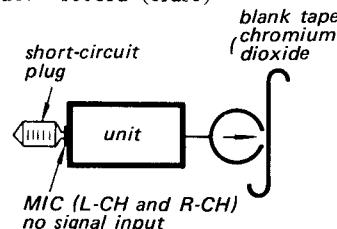
Procedure:

1. Mode: record

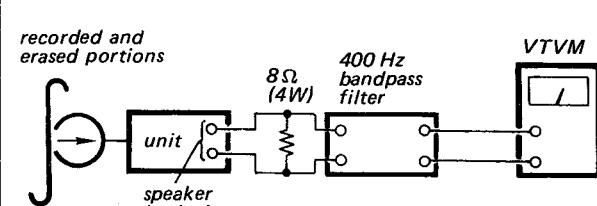


2. Rewind a half of the signal recorded portion of the tape cassette.

3. Mode: record (erase)



4. Mode: playback



Adjust the VOLUME control at signal recorded portion for 0 dB (0.775 V) reading on the VTVM, and make sure that level difference between two portions is as specified.

Specification: 60 dB or more

21. Teacher Channel Erasure Measurement

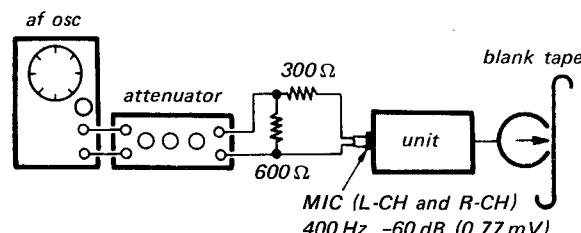
In LL record mode, the student channel is in record mode and the teacher channel in playback mode. The teacher channel is slightly erased by the erase head of the student channel. This measurement is to know how much erased the teacher channel is by adjacent erase head.

Settings:

TAPE SELECT switch NORMAL

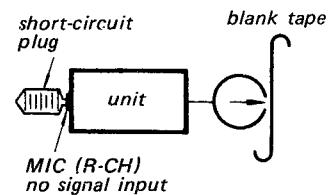
Procedure:

1. Mode: record
 LL/NORMAL switch: NORMAL

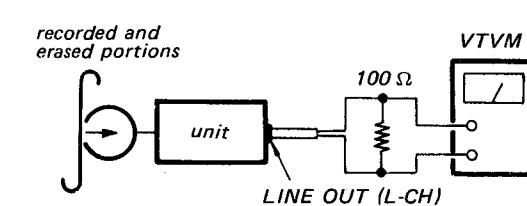


2. Rewind a half of the signal recorded portion of tape cassette.

3. Mode: record (erase)
 LL/NORMAL switch: LL



4. Mode: playback



Make sure that the level difference between two portions is as specified.

Specification: less than 2 dB

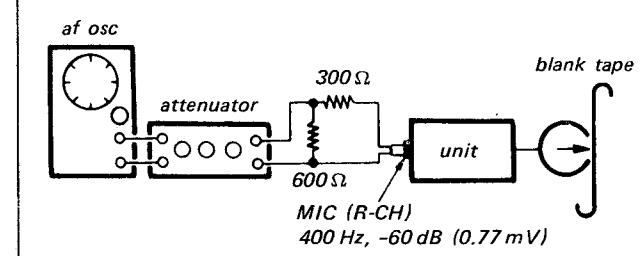
22. Cross Talk (Between Channels) Measurement

Settings:

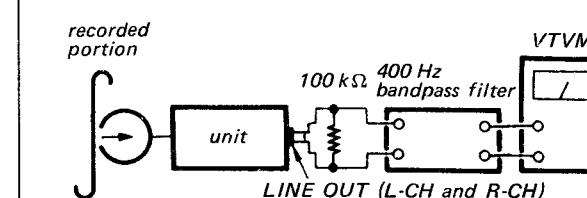
LL/NORMAL switch LL
 TAPE SELECT switch NORMAL

Procedure:

1. Mode: record



2. Mode: playback



a) Move the LL BALANCE control fully to STUDENT, and read the VTVM indication at R-CH LINE OUT.

b) Move the LL BALANCE control fully to TEACHER, and read the VTVM indication at L-CH LINE OUT.

Make sure that the level difference between step a) and step b) is as specified.

Specification: 25 dB or more

SECTION 5

DIAGRAMS

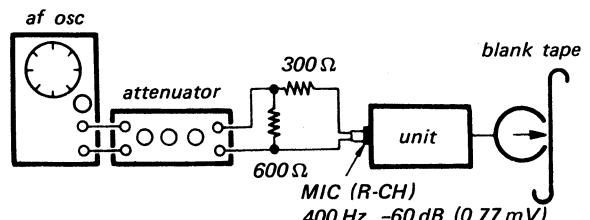
23. Cross Talk (Between Tracks) Measurement

Settings:

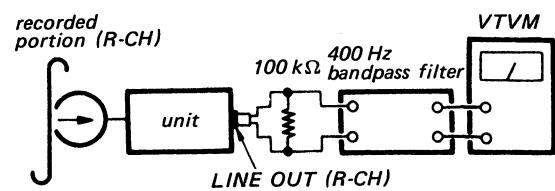
LL/NORMAL switch.....NORMAL
TAPE SELECT switchNORMAL

Procedure:

1. Mode: record



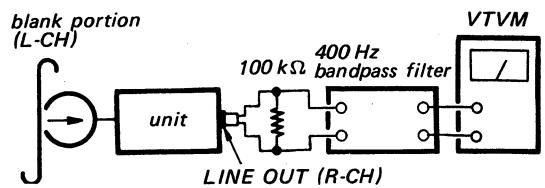
2. Mode: playback



Read the VTVM indication.

3. Mode: playback

Note: Turn over the tape cassette.



Read the VTVM indication.

4. Make sure that the level difference between step 2 and step 3 is as specified.

Specification: 55 dB or more

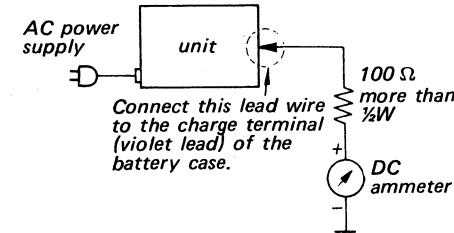
24. Charge Current Check

Settings:

POWER switchOFF

Procedure:

1. Test Setup

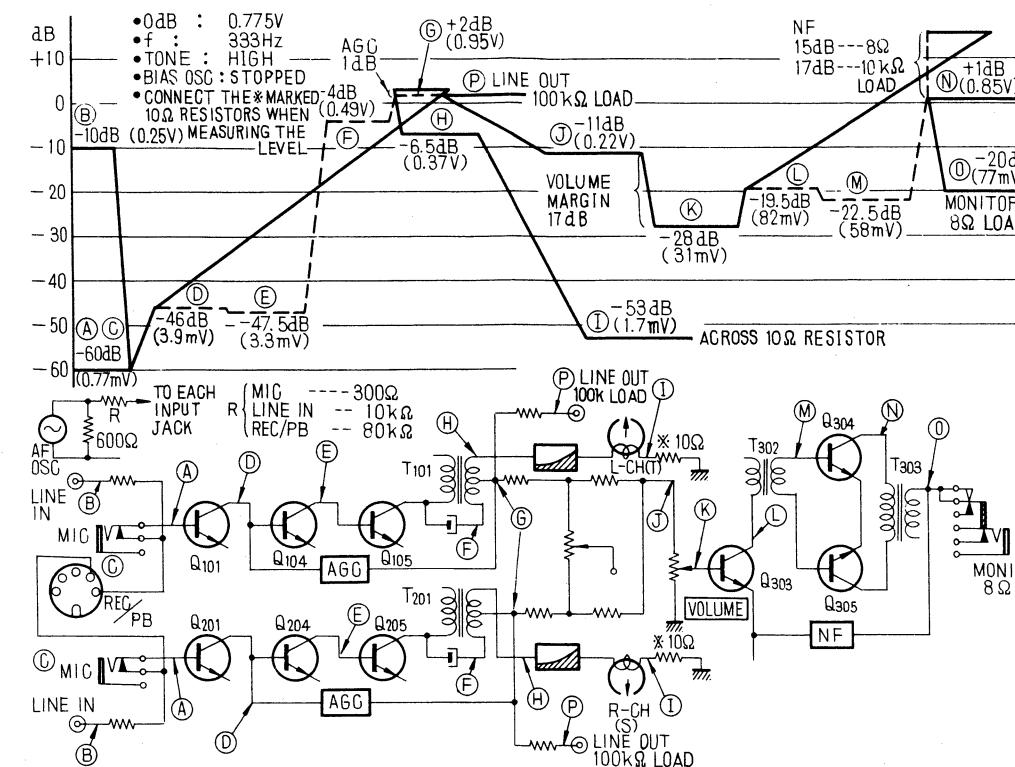


2. Make sure that the reading is as specified.

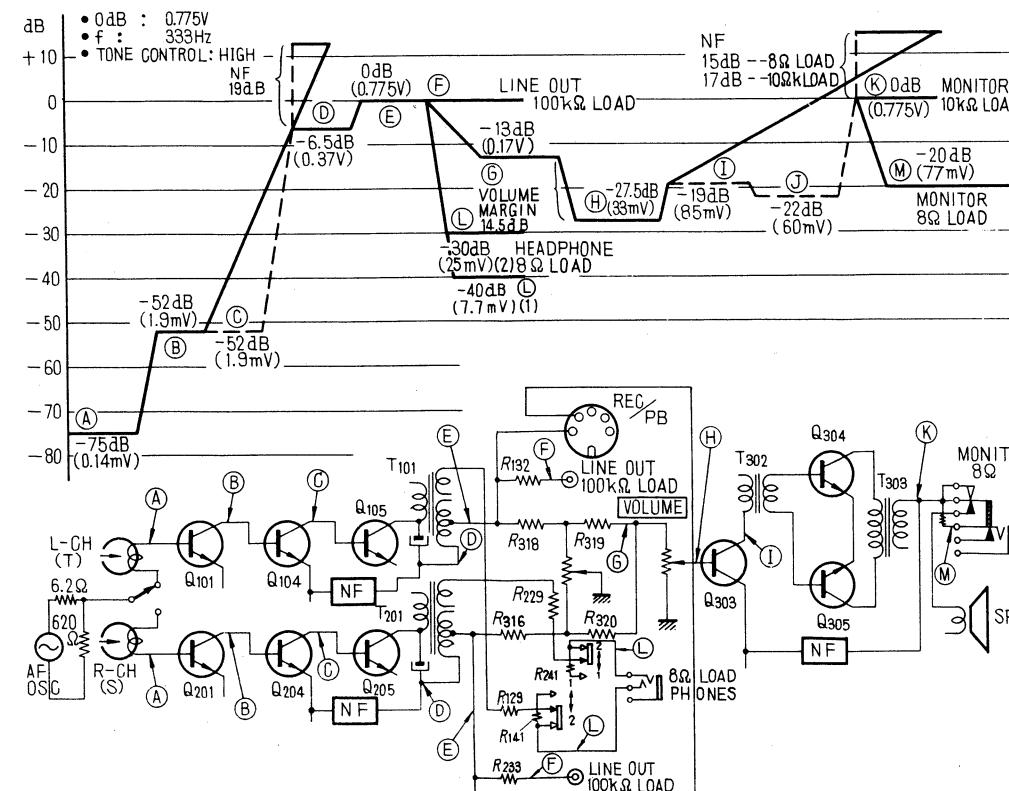
Specification: 45 ~ 75 mA.

5-1. LEVEL DIAGRAM

— NORMAL Record Mode —



— Playback Mode —



SECTION 5 DIAGRAMS

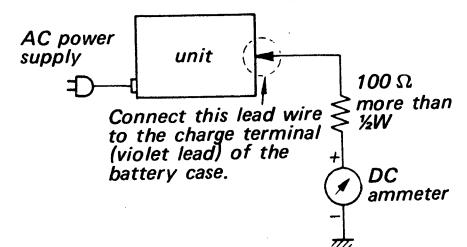
24. Charge Current Check

Settings:

POWER switch OFF

Procedure:

1. Test Setup

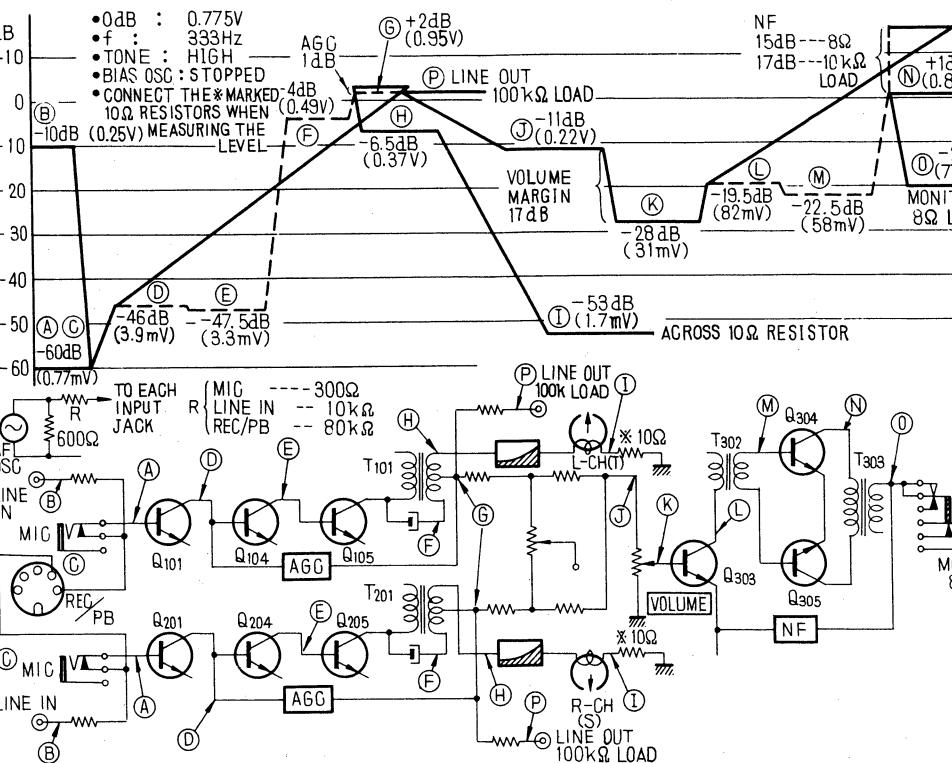


2. Make sure that the reading is as specified.

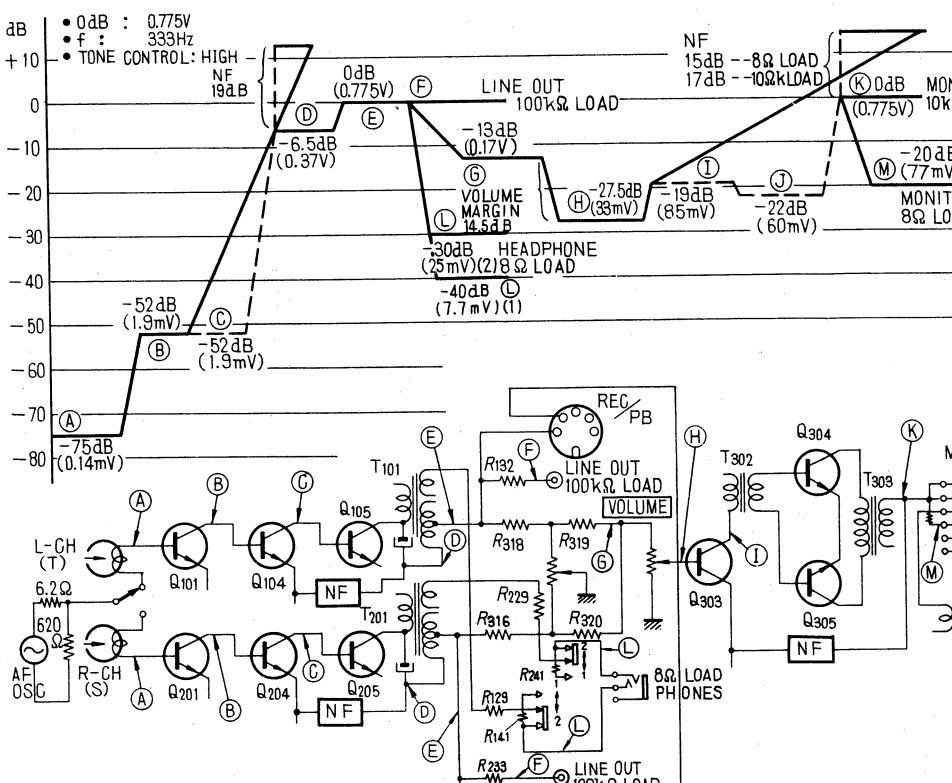
Specification: 45 ~ 75 mA.

5-1. LEVEL DIAGRAM

— NORMAL Record Mode —

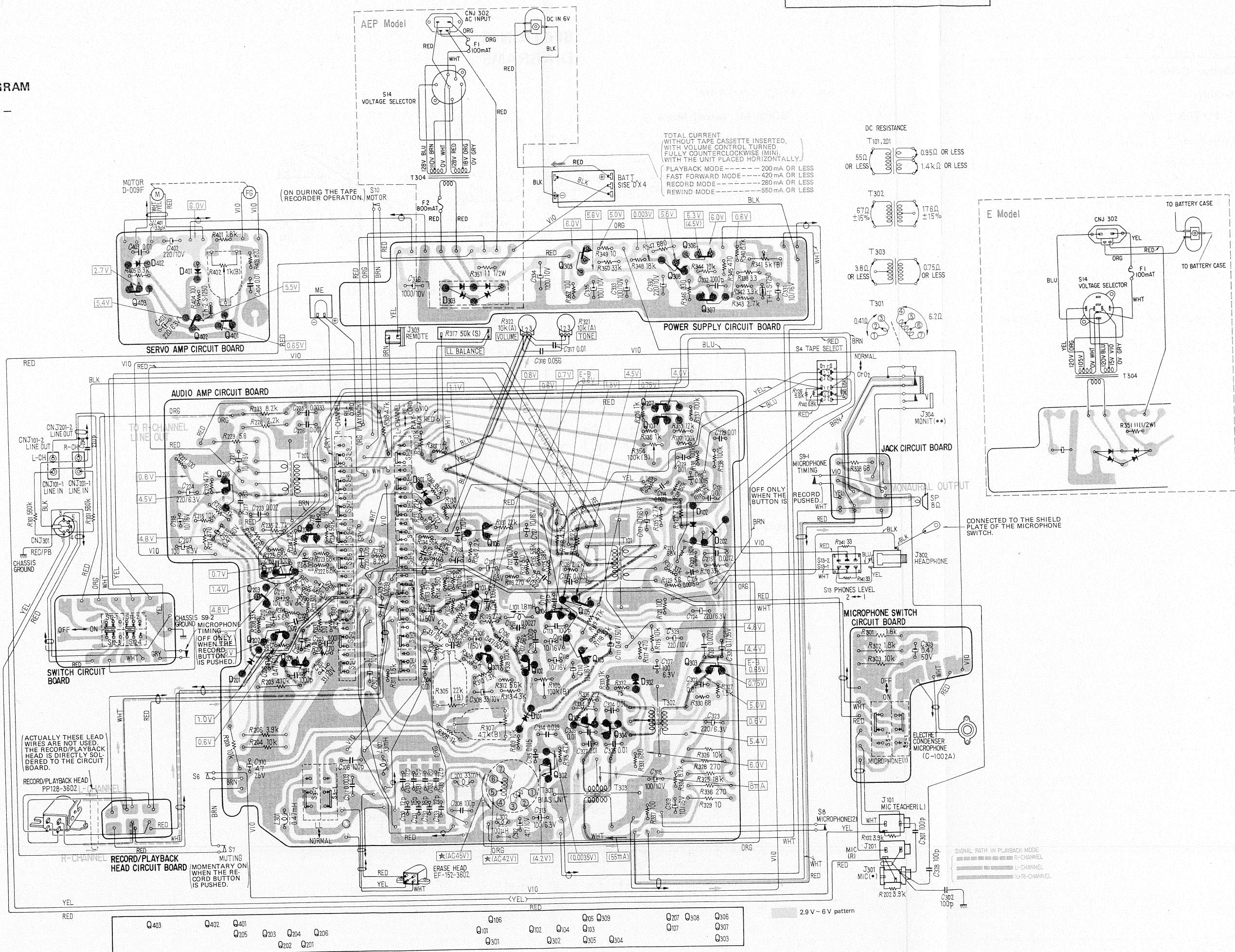


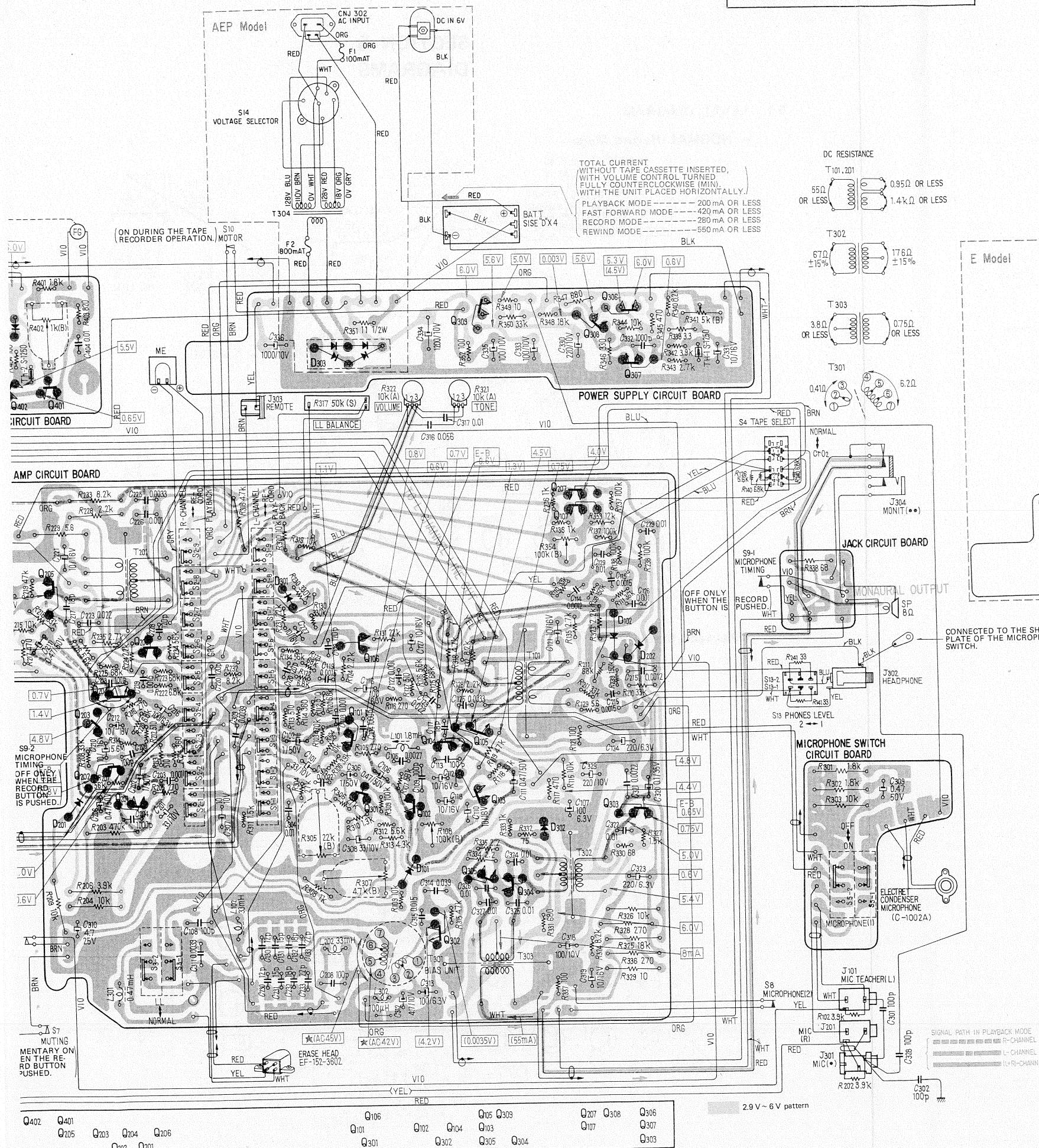
— Playback Mode —



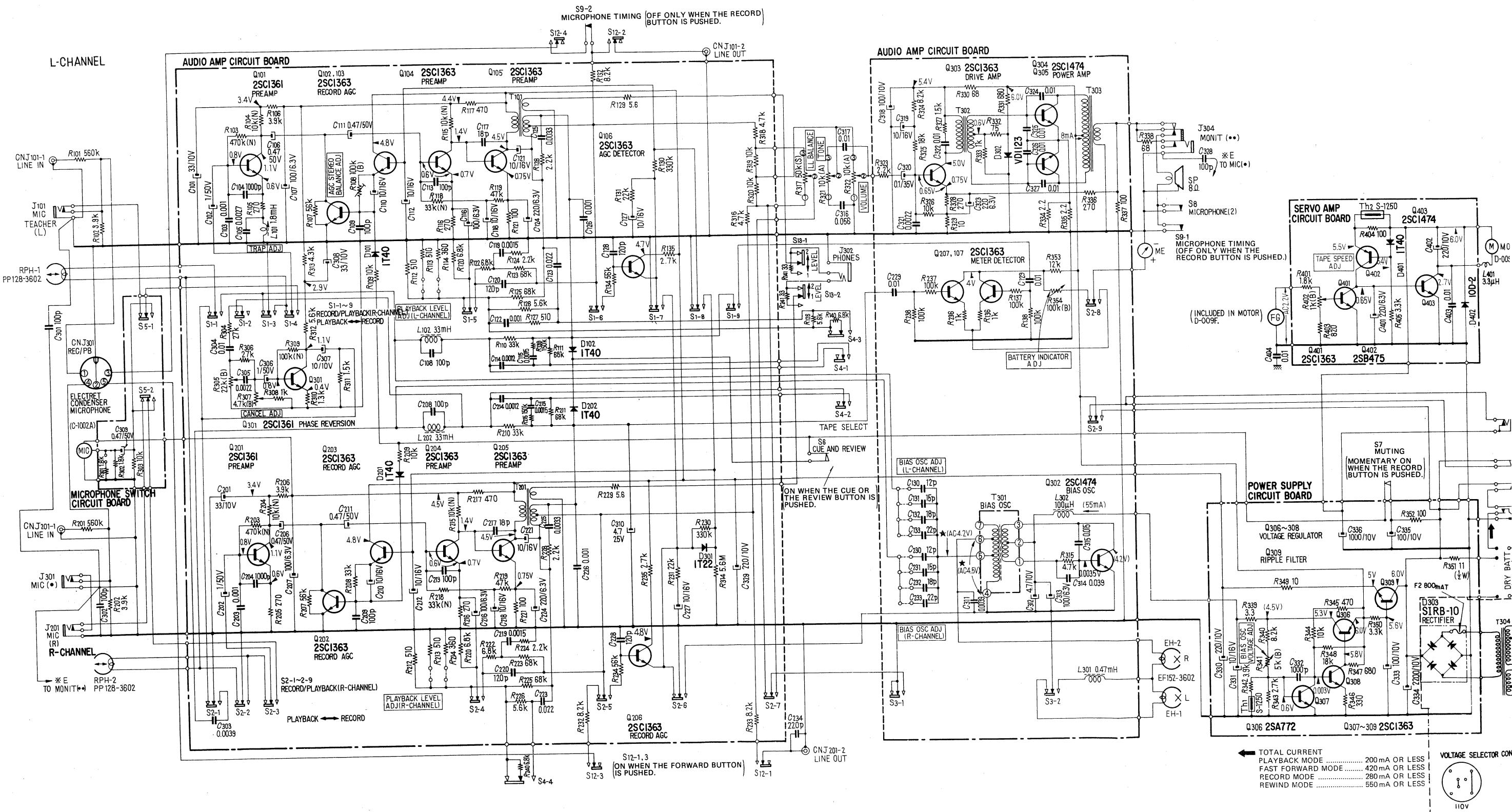
5-2. MOUNTING DIAGRAM

— Conductor Side —

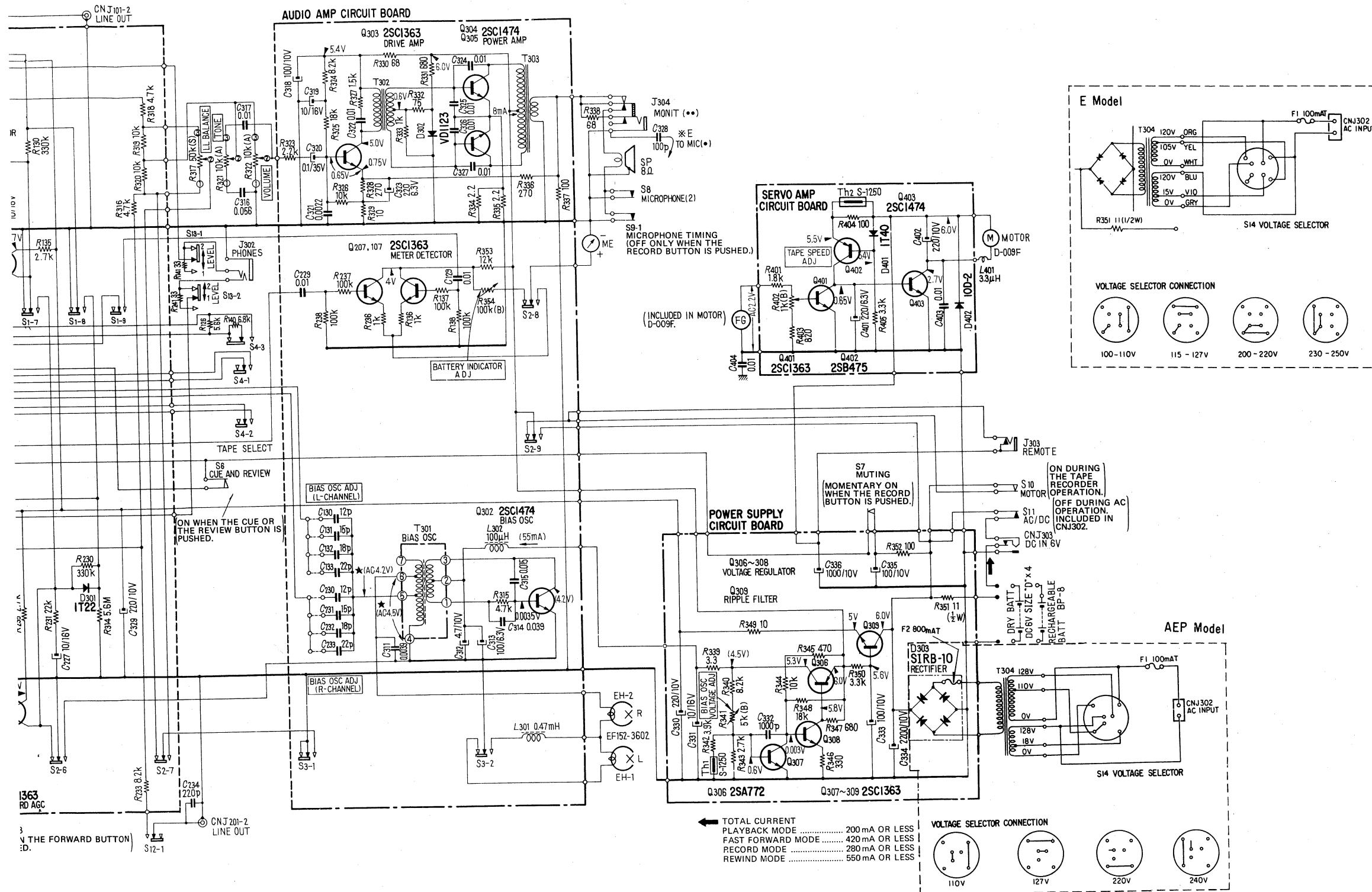




5-3. SCHEMATIC DIAGRAM



3 OFF ONLY WHEN THE RECORD
BUTTON IS PUSHED.



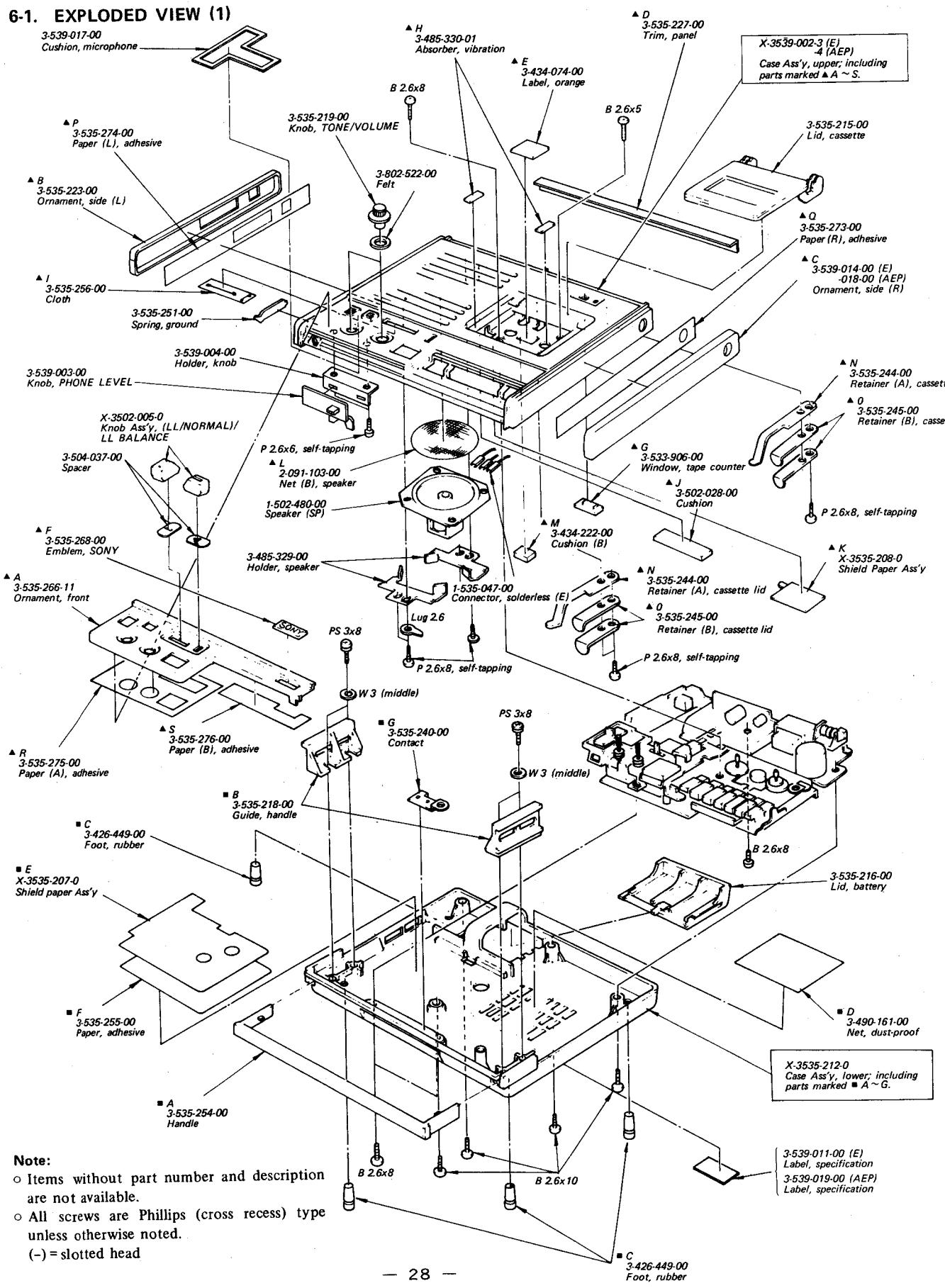
Note:

- All resistors are in Ω , $\%W$ and carbon type unless otherwise indicated. $k = 1000$.
- All capacitors are in μF unless otherwise indicated. $p = \mu u$.
- Letter in () suffixed to variable resistor value indicates characteristics.
- $\sim\sim\sim$: chassis ground
- (N) : low noise resistor
- Voltage values shown are measured to chassis ground with a voltmeter (20 $k\Omega/2V$).
 - no mark : playback mode
 - () : record mode
- Voltage values between the emitter and the base of transistors are measured with 2.5 V range.
- Voltage values marked with * are measured with VTVM.
- Connect R301 resistor into the circuit when a red mark microphone is used.

Ref. No.	Switch	Mode
S1-1-1-9	record/playback (L-channel)	playback
S2-1-2-9	record/playback (R-channel)	playback
S3-1-3-2	LL/NORMAL	NORMAL
S4-1-4-4	TAPE SELECT (CrO ₂ /NORMAL)	NORMAL
S5-1-5-2	MICROPHONE (1) (ON when the built-in microphone is used.)	OFF
S6	CUE and REVIEW (ON when the CUE or the REVIEW button is pushed.)	OFF
S7	muting (momentary ON when the record button is pushed.)	OFF
S8	MICROPHONE (2) (OFF when the built-in microphone is used. jointed to S5.)	ON
S9-1-9-2	microphone timing (this switch turns OFF to stop the output signals through REC/PB connector in record mode.)	ON
S10	motor (ON during the tape recorder operation.)	OFF
S11	AC/DC (OFF during AC operation.) (included in CNJ302.)	DC
S12-1-12-4	LINE OUT and REC/PB (ON when the forward button is pushed.)	OFF
S13	PHONES LEVEL (1/2)	2
S14	voltage selector	E: 100-110 V, 115-127 V 200-220 V, 230-250 V
		AFP: 110 V, 127 V, 220 V, 240 V

SECTION 6
EXPLODED VIEWS AND PACKING

6-1. EXPLODED VIEW (1)

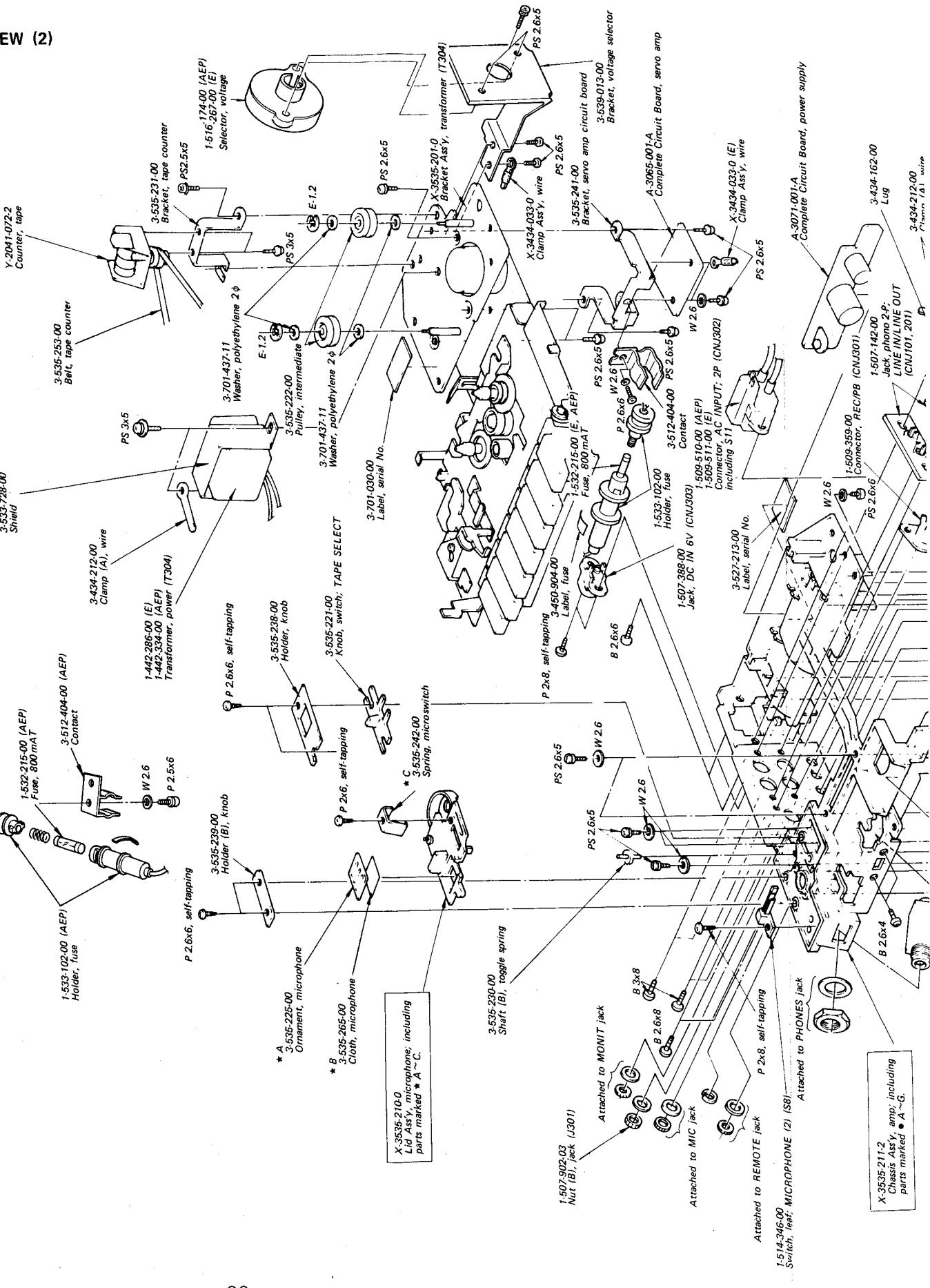


Note

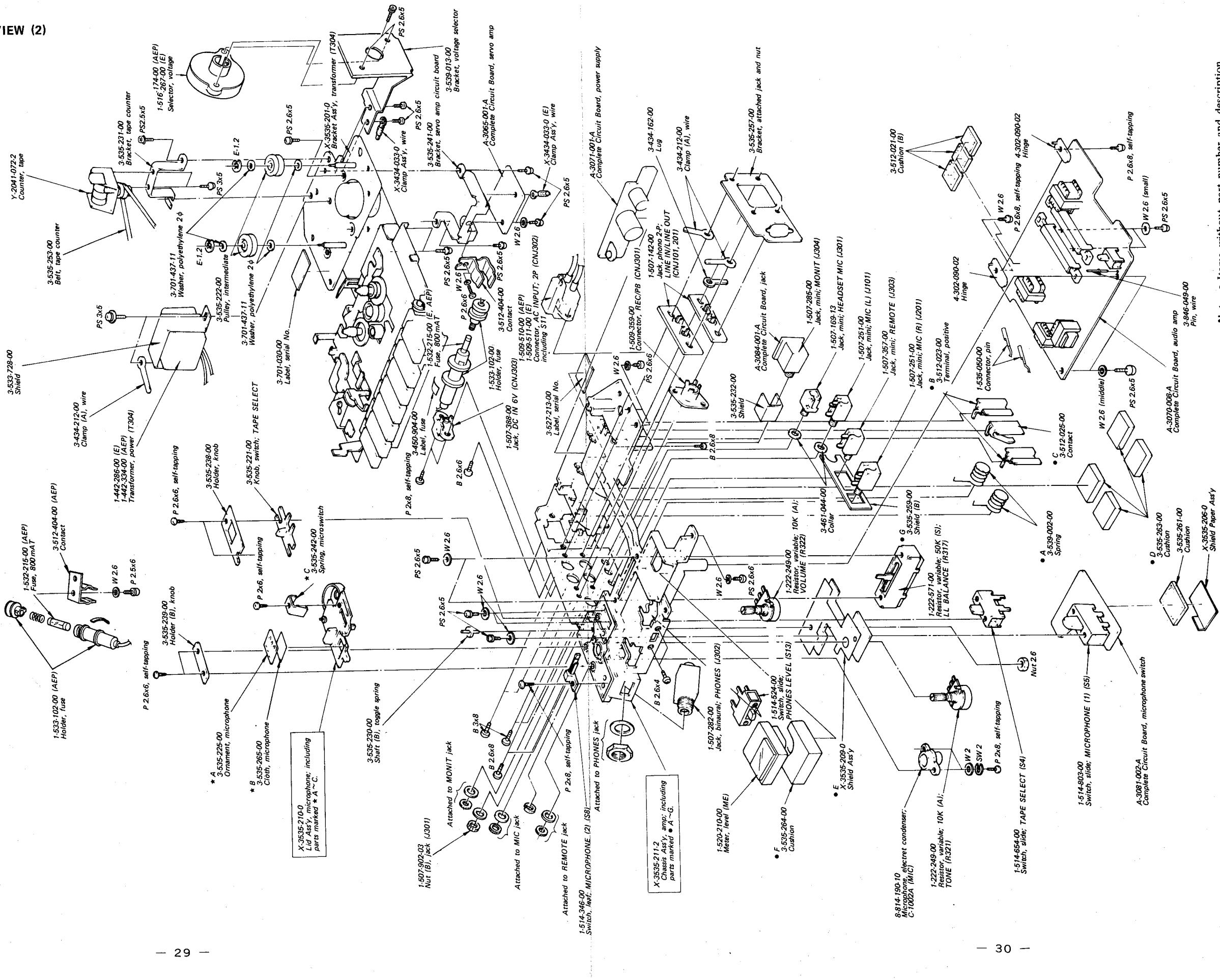
- Items without part number and description are not available.
- All screws are Phillips (cross recess) type unless otherwise noted.
(-) = slotted head

— 28

6-2. EXPLODED VIEW (2)



6-2. EXPLODED VIEW (2)



Note: Items without part number and description are not available.

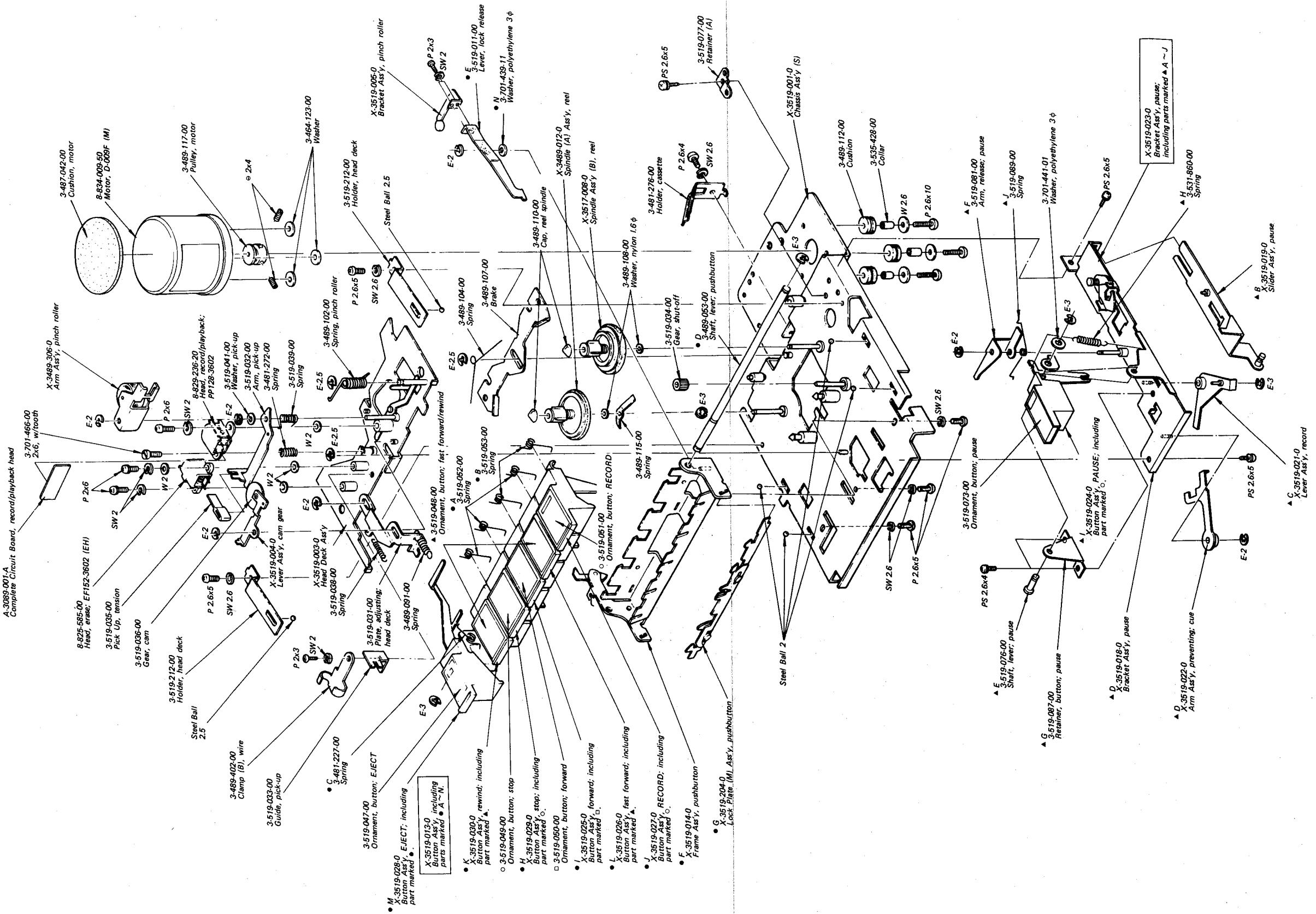
All screws are Phillips (cross recess) type unless otherwise noted.

(\wedge) = slotted head

TC-156

TC-156

6-3. EXPLODED VIEW (3)

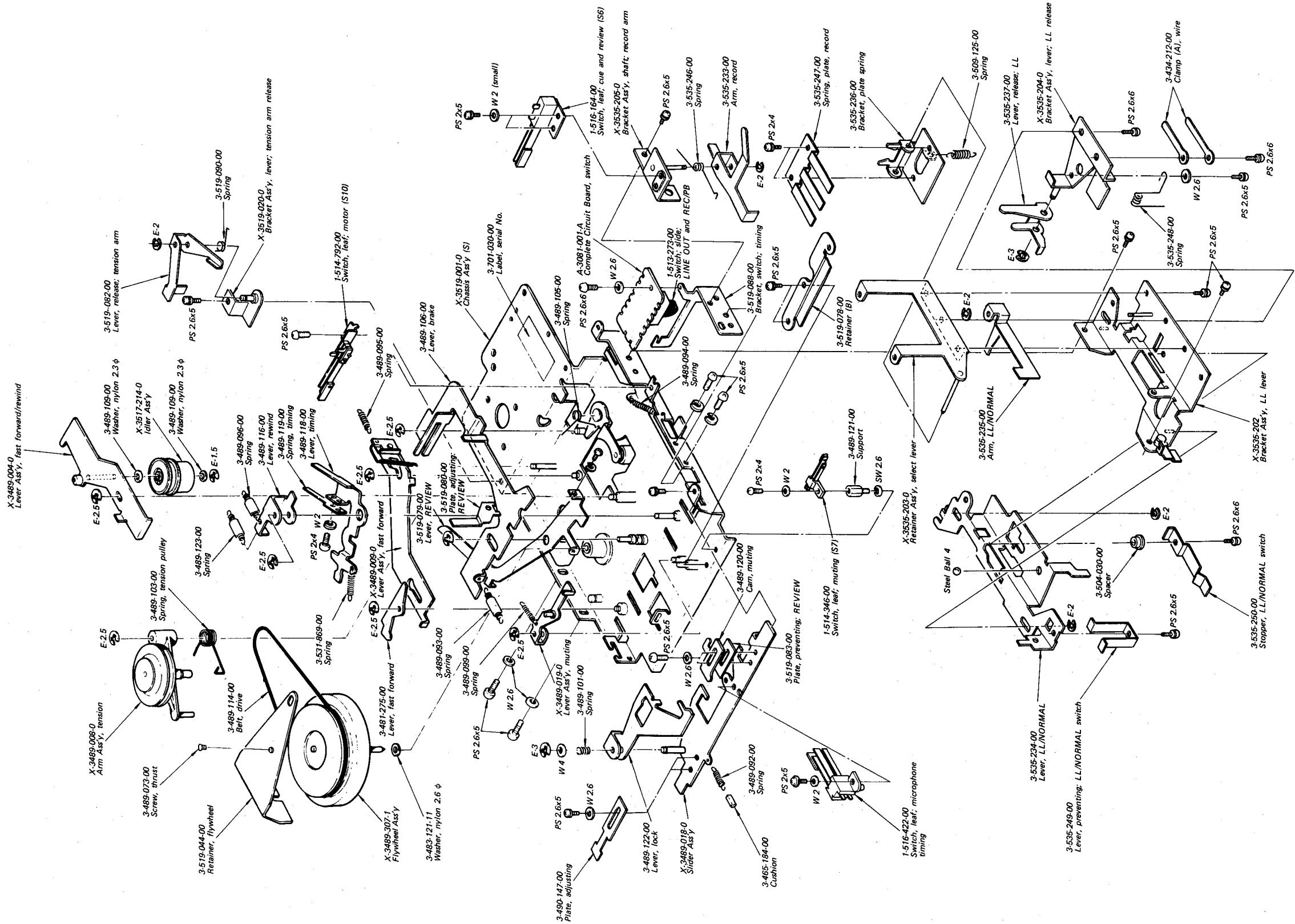


Note:  Items without part number and description are not available.

-  All screws are Phillips (cross recess) type unless otherwise noted.
- (-) = slotted head

TC-156 **TC-156**

6-4. EXPLODED VIEW (4)



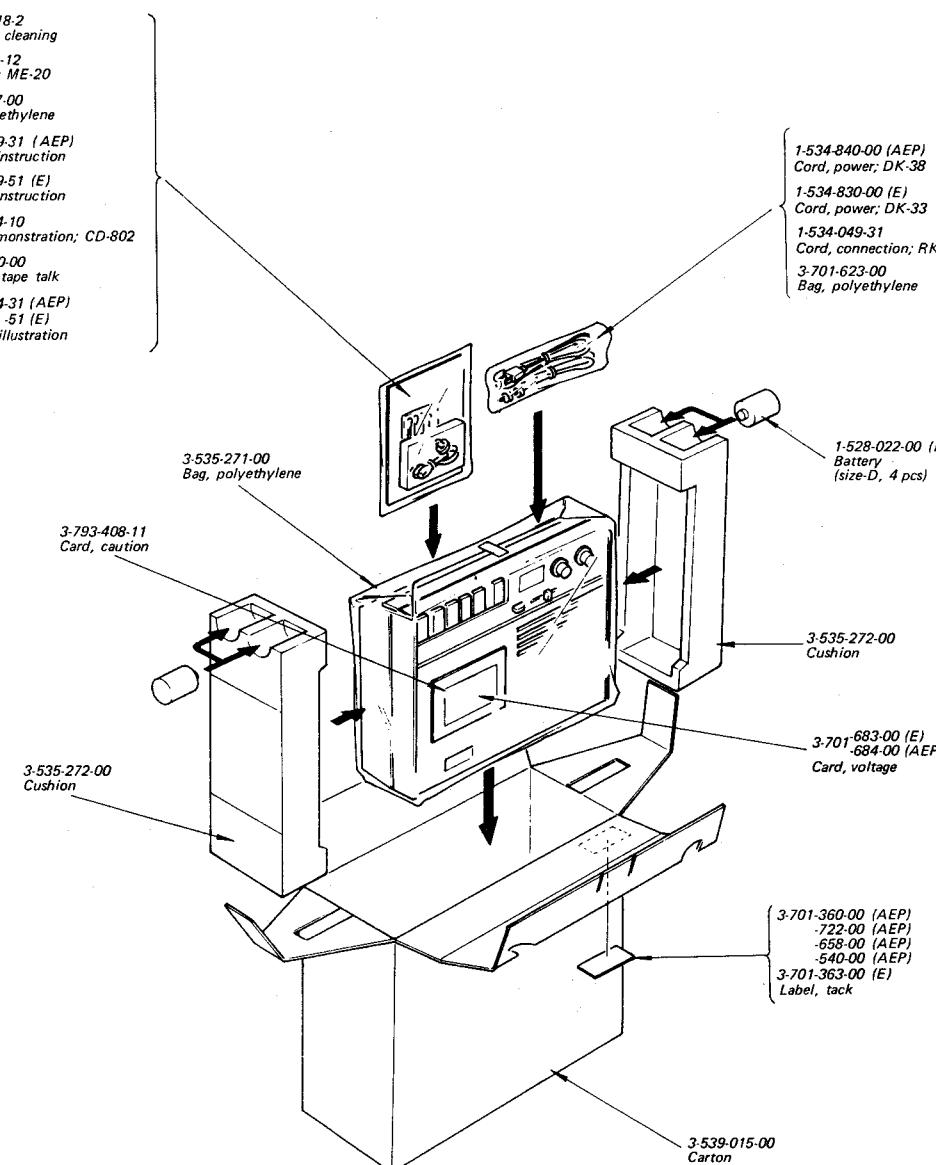
Note: Items without part number and description are not available.

- All screws are Phillips (cross recess) type unless otherwise noted.
- (-) = slotted head

SECTION 7
ELECTRICAL PARTS LIST

6-5. PACKING

X-3701-018-2
 Tip, head cleaning
 1-504-034-12
 Earphone; ME-20
 3-701-627-00
 Bag, polyethylene
 3-780-469-31 (AEP)
 Manual, instruction
 3-780-469-51 (E)
 Manual, instruction
 8-893-504-10
 Tape, demonstration; CD-802
 3-793-010-00
 Booklet, tape talk
 3-793-784-31 (AEP)
 -51 (E)
 Booklet, illustration



Note: o Items without part number and description are not available.

Ref. No.	Part No.	Description	Ref. No.	Part No.	Description		
COMPLETE CIRCUIT BOARDS							
	A-3065-001-A	Servo Amp	L301	1-407-488-00	470 μ H, microinductor		
	A-3070-008-A	Audio Amp	L302	1-407-169-00	100 μ H, microinductor		
	A-3071-001-A	Power Supply	L401	1-407-484-21	3.3 μ H, microinductor		
	A-3081-001-A	Switch					
	A-3081-002-A	Microphone Switch					
	A-3084-001-A	Jack					
	A-3089-001-A	Record/Playback Head					
TRANSFORMERS							
T101, 201	1-427-317-00	Output	T301	1-433-166-00	Bias Osc		
T302	1-423-049-00	Input	T303	1-427-256-00	Output		
T304	1-442-286-00	Power (E)					
	1-442-334-00	Power (AEP)					
SEMICONDUCTORS							
Q101, 201	Transistor 2SC1361						
Q102, 202	Transistor 2SC1363						
Q103, 203	Transistor 2SC1363						
Q104, 204	Transistor 2SC1363						
Q105, 205	Transistor 2SC1363						
Q106, 206	Transistor 2SC1363						
Q107, 207	Transistor 2SC1363						
Q301	Transistor 2SC1361						
Q302	Transistor 2SC1474						
Q303	Transistor 2SC1363						
Q304, 305	Transistor 2SC1474						
Q306	Transistor 2SA772						
Q307 ~ 309	Transistor 2SC1363						
Q401	Transistor 2SC1363						
Q402	Transistor 2SB475						
Q403	Transistor 2SC1474						
D101, 201	Diode 1T-40						
D102, 202	Diode 1T-40						
D301	Diode 1T-22						
D302	Diode VD-1123						
D303	Diode S1RB10						
D401	Diode 1T-40						
D402	Diode 10D-2						
Th1, 2	1-800-199-11	Thermistor S-1250					
COILS							
L101	1-409-141-00	1.8 mH					
L102	1-407-510-00	33 mH, microinductor					
L202	1-407-561-00	33 mH, microinductor					
CAPACITORS							
All capacitors are in μ F unless otherwise indicated. (p = $\mu\mu$, elect = electrolytic)							
C101, 202	1-121-402-11	33	10V	elect			
C102, 202	1-121-391-11	1	50V	elect			
C103, 203	1-105-661-12	0.001	50V	mylar			
C104, 204	1-102-074-11	1000 P	50V	ceramic			
C105	1-105-666-12	0.0027	50V	mylar			
C106, 206	1-121-726-11	0.47	50V	elect			
C107, 207	1-121-413-11	100	6.3V	elect			
C108, 208	1-107-169-11	100 P	500V	silvered mica			
C109, 209	1-102-106-11	100 P	50V	ceramic			
C110, 210	1-121-651-11	10	16V	elect			
C111, 211	1-121-726-11	0.47	50V	elect			
C112, 212	1-121-651-11	10	16V	elect			
C113, 213	1-102-106-11	100 P	50V	ceramic			
C114, 214	1-105-662-12	0.0012	50V	mylar			
C115, 215	1-105-663-12	0.0015	50V	mylar			
C116, 216	1-121-413-11	100	6.3V	elect			
C117, 217	1-107-113-11	18 P	50V	silvered mica			
C118, 218	1-121-651-11	10	16V	elect			
C119, 219	1-105-663-12	0.0015	50V	mylar			
C120, 220	1-107-133-11	120 P	50V	silvered mica			
C121, 221	1-121-651-11	10	16V	elect			
C122	1-105-661-12	0.001	50V	mylar			
C123, 223	1-105-677-12	0.022	50V	mylar			
C124, 224	1-121-419-11	220	6.3V	elect			
C125, 225	1-105-667-12	0.0033	50V	mylar			
C126, 226	1-105-661-12	0.001	50V	mylar			
C127, 227	1-121-651-11	10	16V	elect			

Ref. No.	Part No.	Description			Ref. No.	Part No.	Description			Ref. No.	Part No.	Description			
C128, 228	1-107-133-11	120 P	50V	silvered mica	RESISTORS			R203	1-242-737-09	470 k	low noise	R340	1-244-695-11	8.2 k	
C129, 229	1-105-833-12	0.01	50V	mylar	All resistors are $\frac{1}{4}$ W, carbon type, and in Ω unless otherwise indicated. (k = 1000, M = 1000 k)			R204	1-242-697-09	10 k	low noise	R341	1-221-311-21	5 k (B) adjustable	
C130, 230	1-107-050-11	12 P	500V	silvered mica				R206	1-244-687-11	3.9 k		R342	1-242-687-11	3.9 k	
C131, 231	1-107-051-11	15 P	500V	silvered mica				R208	1-244-709-11	33 k		R343	1-242-683-11	2.7 k	
C132, 232	1-107-001-11	18 P	500V	silvered mica				R209	1-244-697-11	10 k		R344	1-242-697-11	10 k	
C133, 233	1-107-052-11	22 P	500V	silvered mica								R345	1-242-665-11	470	
C201	1-131-195-11	33	10V	solid tantalum	R101, 201	1-244-739-11	560		R226	1-244-691-11	5.6 k		R346	1-242-661-11	330
C234	1-102-110-11	220 P	50V	ceramic	R102, 202	1-244-687-11	3.9 k	R103, 203	1-242-737-09	470 k	low noise	R347	1-242-669-11	680	
C301, 302	1-102-106-11	100 P	50V	ceramic	R104, 204	1-242-697-09	10 k	R105, 205	1-242-659-11	270	low noise	R348	1-242-703-11	18 k	
C303	1-105-669-12	0.0039	50V	mylar	R106, 206	1-242-687-11	3.9 k		R228	1-244-681-11	2.2 k		R349	1-242-625-11	10
C304	1-105-673-12	0.01	50V	mylar	R107, 207	1-242-715-11	56 k		R229	1-244-623-11	8.2				
C305	1-105-665-12	0.0022	50V	mylar	R108	1-222-845-00	100 k (B) adjustable		R301, 302	1-244-679-11	1.8 k		R350	1-242-685-11	3.3 k
C306	1-121-391-11	1	50V	elect	R109	1-242-697-11	10 k		R303	1-244-697-11	10 k		R351	1-244-826-11	11 ($\frac{1}{2}$ W) (E)
C307	1-131-193-11	10	10V	solid tantalum	R110, 210	1-242-709-11	33 k		R304	1-242-707-11	27 k		R352	1-242-649-11	100
C308	1-121-402-11	33	10V	elect	R111, 211	1-242-717-11	68 k		R305	1-222-775-00	22 k (B) adjustable		R353	1-242-699-11	12 k
C309	1-121-726-00	0.47	50V	elect	R112, 212	1-242-666-11	510		R306	1-242-707-11	27 k		R354	1-222-845-00	100 k (B) adjustable
C310	1-121-395-11	4.7	25V	elect	R113, 213	1-242-662-11	360					R401	1-242-679-11	1.8 k	
C311	1-129-861-11	0.0039	500V	polypropylene	R114, 214	1-242-662-11	360	R115, 215	1-242-697-09	10 k	low noise	R402	1-222-771-00	1 k (B) adjustable	
C312	1-131-192-11	4.7	10V	solid tantalum	R116, 216	1-242-659-11	270		R307	1-222-773-00	4.7 k (B) adjustable		R403	1-242-671-11	820
C313	1-121-413-11	100	6.3V	elect	R117, 217	1-242-665-11	470		R308	1-242-673-11	1 k		R404	1-242-649-11	100
C314	1-105-680-12	0.039	50V	mylar	R118, 218	1-242-709-09	33 k	R119, 219	1-242-713-11	47 k	low noise	R405	1-242-685-11	3.3 k	
C315	1-105-675-12	0.015	50V	mylar	R120, 220	1-242-693-11	6.8 k		R312	1-242-691-11	5.6 k				
C316	1-105-682-12	0.056	50V	mylar	R121, 221	1-242-649-11	100		R313	1-242-688-11	4.3 k				
C317	1-105-673-12	0.01	50V	mylar	R122, 222	1-242-693-11	6.8 k		R314	1-202-473-31	5.6M	composition			
C318	1-121-414-11	100	10V	elect	R123, 223	1-242-717-11	68 k		R315	1-242-689-11	4.7 k		S1, 2	1-514-976-00	Slide, record/playback
C319	1-121-651-11	10	16V	elect	R124, 224	1-242-681-11	2.2 k		R316	1-242-689-11	4.7 k		S3	1-514-803-00	Slide, LL/NORMAL
C320	1-131-209-21	0.1	35V	solid tantalum	R125, 225	1-242-717-11	68 k		R317	1-222-571-00	50 k (S) adjustable		S4	1-514-654-00	Slide, TAPE SELECT
C321	1-105-665-12	0.0022	50V	mylar	R126	1-242-691-11	5.6 k		R318	1-242-689-11	4.7 k		S5	1-514-803-00	Slide, MICROPHONE (1)
C322	1-105-833-12	0.01	50V	mylar	R127	1-242-666-11	510		R319, 320	1-242-697-11	10 k		S6	1-516-164-00	Leaf, cue and review
C323	1-121-419-11	220	6.3V	elect	R128	1-242-681-11	2.2 k		R321	1-222-249-00	10 k (A), variable; TONE		S7	1-514-346-00	Leaf, muting
C324 ~ 327	1-101-923-11	0.01	25V	ceramic	R129	1-242-623-11	82		R322	1-222-249-00	10 k (A), variable; VOLUME		S8	1-514-346-00	Leaf, MICROPHONE (2)
C328	1-102-106-11	100 P	50V	ceramic	R130, 230	1-242-733-11	330 k		R323	1-242-681-11	2.2 k		S9	1-516-422-00	Leaf, microphone timing
C329, 330	1-121-420-11	220	10V	elect	R131, 231	1-242-705-11	22 k		R324	1-242-695-11	8.2 k		S10	1-514-792-00	Leaf, motor
C331	1-121-651-11	10	16V	elect	R132, 232	1-242-695-11	8.2 k		R325	1-244-703-11	18 k		S11		Included in AC INPUT (CNJ302), AC/DC
C332	1-102-074-11	1000 P	50V	ceramic	R133, 233	1-242-721-11	100 k		R326	1-244-697-11	10 k		S12	1-513-273-00	Slide, LINE OUT (REC/PB)
C333	1-121-414-11	100	10V	elect	R134, 234	1-242-715-11	56 k		R327	1-242-677-11	1.5 k		S13	1-514-524-00	Slide, PHONES LEVEL
C334	1-121-659-11	2200	10V	elect	R135, 235	1-242-683-11	2.7 k		R328	1-244-659-11	270		S14	1-516-267-00	Slide, voltage selector (E)
C335	1-121-414-11	100	10V	elect	R136, 236	1-242-673-11	1 k		R329	1-244-625-11	10				
C336	1-121-736-11	1000	10V	elect	R137, 237	1-242-721-11	100 k		R330	1-242-645-11	68				
C401	1-121-419-11	220	6.3V	elect	R138, 238	1-242-725-11	150 k		R331	1-242-669-11	680		J101, 201	1-507-251-00	Mini, MIC
C402	1-121-420-11	220	10V	elect	R139, 239	1-242-693-11	6.8 k		R332	1-242-646-11	75		J301	1-507-169-13	Mini, MIC (HEADSET)
C403, 404	1-101-923-11	0.01	25V	ceramic	R140, 240	1-242-693-11	6.8 k		R333	1-242-673-11	1 k		J302	1-507-282-00	Binaural, PHONES
					R141, 241	1-242-637-11	33		R334, 335	1-242-609-11	2.2		J303	1-507-357-00	REMOTE (MIC)
					R142, 242	1-242-697-11	100		R336	1-244-659-11	270		J304	1-507-285-00	Mini, MONIT (HEADSET)
					R143, 243	1-242-697-11	100		R337	1-242-649-11					

<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>	<u>Ref. No.</u>	<u>Part No.</u>	<u>Description</u>
CNJ302	1-509-510-00	2P, AC INPUT, including S11 (AEP)	MIC	8-814-190-10	Microphone, electret condenser; C-1002A
CNJ302	1-509-511-00	2P, AC INPUT, including S11 (E)	RPH	8-829-236-20	Head, record/playback; PP128-3602
CNJ303	1-507-388-00	DC IN 6V	SP	1-502-480-00	Speaker
MISCELLANEOUS					
EH	8-825-585-00	Head, erase; EF152-3602		1-535-047-00	Connector, solderless (E)
M	8-834-009-50	Motor, D-009F		1-535-050-00	Connector, pin
ME	1-520-210-00	Meter, level	F1	1-532-084-00	Fuse, 100 mAT
			F2	1-532-215-00	Fuse, 800 mAT (AEP)
				1-533-102-00	Holder, fuse
				1-516-267-00	Switch, voltage selector (E)
				1-516-174-00	Switch, voltage selector (AEP)

SECTION 8

HARDWARE

<u>Part No.</u>	<u>Description</u>		<u>Part No.</u>	<u>Description</u>	
SCREWS		RETAINING RINGS		NUT	
All screws are Phillips type (cross recess type) unless otherwise indicated. (-): slotted head.		2.6x5		2.6x4	
7-621-170-39	(-)	2x4	7-623-108-05	3	middle
7-621-255-15	P	2x3	7-623-108-11	3	middle
7-621-255-25	P	2x4	7-623-110-02	4	
7-621-255-45	P	2x6	7-623-205-22	2	spring
7-621-259-25	P	2x4	7-623-205-31	2	spring
2.6x5		2.6x10		2.6x10	
7-621-259-35	P	2.6x5	7-624-101-01	E1	1.2
7-621-259-65	P	2.6x10	7-624-102-01	E	1.5
7-621-770-50	B	2.6x6	7-624-104-01	E	2
7-621-770-62	B	2.6x5	7-624-106-01	E	3
7-621-770-94	B	2.6x10	7-624-108-01	E	4
2.6x8		2.6x4		2.6x8	
7-671-771-38	B	2.6x8	7-624-118-01	E	2.5
7-621-773-65	B	2.6x4	7-624-124-01	C2	
7-682-523-03	B	2x3	LUG		
7-682-549-05	B	3x8	2.6		
7-682-624-01	PS	2x4	2.6		
2.6x5		STEEL BALLS		RIVET	
7-682-625-01	PS	2x5	7-671-112-01	2	steel ball
7-628-253-92	PS	2.6x4	7-671-112-11	2.5	steel ball
7-628-254-05	PS	2.6x5	7-671-114-01	4	steel ball
7-628-254-15	PS	2.6x6	2.6x3		
7-682-646-01	PS	3x5	2.6x3		
7-682-648-01	PS	3x8	2.6x3		
2.6x6, self-tapping		2.6x8, self-tapping		2.6x3	
7-685-104-21	P	2x6, self-tapping	7-623-508-01		
7-685-105-21	P	2x8, self-tapping	2.6x3		
7-685-133-21	P	2.6x6, self-tapping	2.6x3		
7-685-134-21	P	2.6x8, self-tapping	2.6x3		
WASHERS		STEEL BALLS		RIVET	
7-623-105-01	2	small	7-671-112-01	2	steel ball
7-623-105-02	2	small	7-671-112-11	2.5	steel ball
7-623-105-15	2		7-671-114-01	4	steel ball
7-623-107-01	2.6	small	2.6x3		
7-623-107-02	2.6	small	2.6x3		
2.6		middle		2.6x3	
7-623-107-11	2.6	middle	7-625-112-11		
7-623-107-12	2.6		2.6x3		

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